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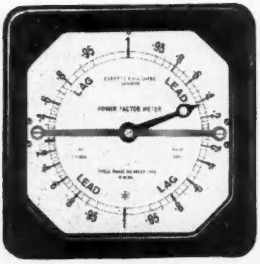

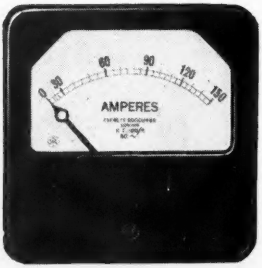

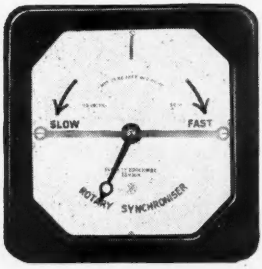

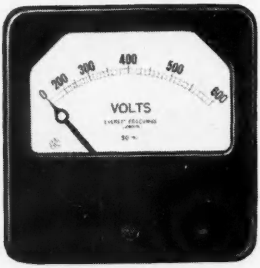

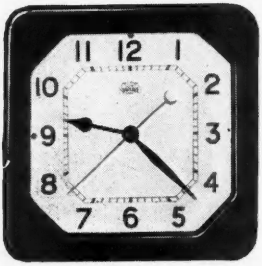

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ELECTRICAL REVIEW

Vol. CXLIX No. 3847 17TH AUGUST, 1951

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Power Shortage

PALLIATIVES AND ULTIMATE SOLUTION

REGULAR warnings of the possibility of even worse power cuts during the next winter have prepared the public for the very grim report of the Electricity Sub-Committee of the Joint Consultative Committee with which we deal in this issue.

Since the black days of 1947 this Sub-Committee has been studying the problem and up to last winter was able to recommend successive relaxations of the measures necessary to spread the industrial load as a means of avoiding "shedding." But in the early autumn of last year a combination of cold weather, an unexpectedly heavy increase in demand and a greater "outage" of plant than had been anticipated caused heavy overloading of the power system and consequent power cuts.

Increasing Demand

Last winter was not a severe one; the next one may be. Demand has kept up with the addition to generating capacity and so, at the best, there must be a gap of 1,800 MW between the demand and the amount of plant to meet it. At the worst, the deficiency may be as much as 3,100 MW.

It follows that unless there is to be widespread stoppage of supply strong measures must be taken to even out the load on the power system. The demand comes in equal proportions from industrial and non-industrial (including domestic) consumers. The latter class, comprising millions of individuals, cannot be treated with as can industrialists. Domestic supplies can be cut off, but they are often combined with industrial and other essential supplies—indeed they themselves may frequently be essential—and so arbitrary pulling of switches is a Draconian solution.

Domestic Load Control

The control of the domestic load is another possibility but this does not merely mean, as many people think, the installation of relays and cut-outs. For one thing it is desirable to discriminate between lighting and other uses and nowadays there is no separate metering in thousands of cases. Nevertheless control is being considered by the B.E.A. and Electricity Boards, although it could not be introduced on a sufficiently large scale for a considerable time.

Industry, being in larger units, can be more easily tackled and is consequently relied upon to contribute most to the spreading of the load. Industrialists are given the choice of loss of production through sudden power

stoppages or the rearrangement of their work to reduce their peak demands. Of these two evils the latter must be considered the less (but still very big). It involves considerable dislocation of the set habits of the employees for it means adjustment of working hours, the introduction of double shifts or a great deal more night work.

The British Employers' Confederation and the Trades Union Congress are convinced of the need for such arrangements; it remains for them both (particularly the T.U.C.) to convince their constituents. This will not be easy and probably some sort of inducement will be necessary.

Whether these arrangements are to be regarded as palliatives or as a permanent solution of the power problem depends upon the progress made in the provision of generating plant. In any event that work must be accelerated. The demand for electricity will not slacken and much of the existing plant must be replaced soon. To those who say " Defence must come first " we must point out once more that unless there is adequate electricity the rearmament programme will be seriously retarded.

STEEL AND POWER

The only real way of permanently avoiding the necessity for electricity " cuts " is to build more power stations more quickly. An awkward aspect of this large task is that, simultaneously with the continually growing consumption of electricity, the time needed to construct a modern generating station is lengthening up to seven years. The general manager of the North of Scotland Board explained in the paper he read at the B.A. meeting this week that a steam station requires 212 tons of steel (a water power station needs 145 tons) per 1,000 kW installed. Doubling last year's effort to enable two million kW of steam plant to be commissioned each year would call for not more than 2·5 per cent of the country's steel output.

LOSS OF PRODUCTION

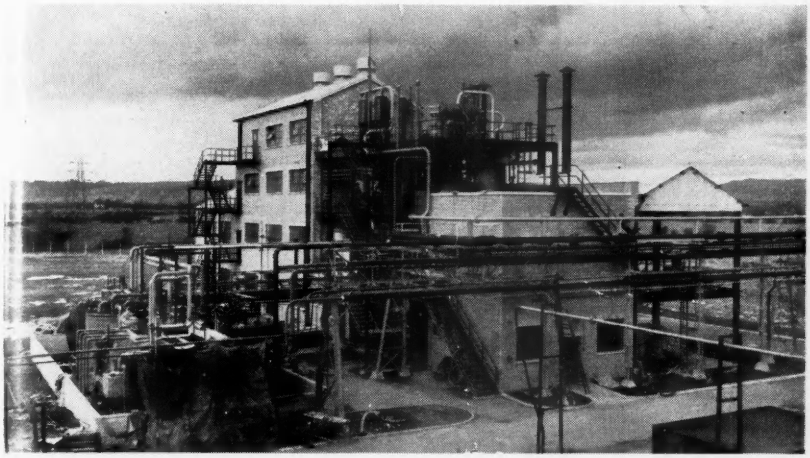
There is no doubt that power cuts have had adverse effects upon production but there is no satisfactory means of gauging the actual loss. The Minister of Fuel and Power has several times quoted a figure of £8 to £10 million for an unspecified period of last winter. Now it is reported that Mr. Victor Feather, assistant secretary of the Trades Union Congress, has forecast that winter power cuts may cost £4 million a week in lost output from factories. If this figure can be accepted, the loss during the winter quarter would amount to £52 million which is probably less than 1 per cent of the annual gross output of manufacturing concerns. This figure does not look large but any loss of production is serious in our present circumstances and every possible means of avoiding it must be pursued.

OVERTIME BAN

A too-substantial proportion of our generating plant is over-age and normally would have been replaced long ago. In present circumstances it has to be retained but its retention means a colossal amount of extra maintenance work. Overhauling of plant in preparation for the winter involves much overtime and, in general, this has been accepted by the men who do the work. As a protest against the B.E.A.'s offer of about half of a wage increase demanded by the men, however, employees in a number of London power stations recently decided not to put in any overtime. The continuance of this attitude will naturally worsen a situation which is already very serious and it is to be hoped that the B.E.A.'s appeal for the honouring of agreements will be successful.

POWER FOR GOLD MINES

The large construction programme which the South African Electricity Supply Commission has in hand will not greatly alleviate the present power shortage there for two or three years to come. In the meantime efforts are being made to minimize the effect of the restrictions on the gold mining industry, on which the country's prosperity largely depends. To this end the Government earlier this year relaxed the law banning milling on Sundays. Some easement of the peak load problem was secured last year by appeals to consumers generally for voluntary economy, but, as in this country, it has been found that more definite restrictions are required. The form of these in the case of the Rand undertaking is to limit the maximum demands of municipalities and other large consumers as well as to postpone all schemes for new supplies except for essential services or where they are in the national interest.



The "Aroclors" plant at Newport, Mon. *(Photo by courtesy of Monsanto Chemicals, Ltd.)*

Synthetic Organic Chemicals

Their Use as Insulation Media

By N. G. H. THOMAS, B.SC.*

WITHIN recent weeks a new chemical plant situated at Newport, Monmouthshire, began production of a range of synthetic organic materials which belongs to the series of chlorinated diphenyls and polyphenyls.

These materials have been known for a number of years in the United States and Germany. In the former country they have gained an important position as insulating media in the electrical industry. They are used in capacitors, transformers, cable jointings, flame-proofing of cables, coatings for resistors and similar applications where their outstanding chemical stability and non-inflammability combine with their excellent electrical properties to answer some of the urgent problems of the electrical engineer.

These chlorinated diphenyls are sold by the manufacturers as the Aroclors† and the various grades are distinguished by the use of a code number, the last two digits of which indicate the percentage, by weight, of chlorine in the molecule. Thus, for instance, Aroclor 1254 is a chlorinated diphenyl containing 54 per cent by weight of chlorine, and corresponds approximately to a mixture of the isomers of pentachlorodiphenyl. Thus the whole range can be set up from the mono- to the fully-chlorinated decachlorodiphenyl, as in Table I.

† "Aroclor" is a registered trade mark.

* Monsanto Chemicals, Ltd.

TABLE I

CHEMICAL COMPOSITION OF THE AROCLORS

Grade	Chlorine by weight per cent	Approximate chemical constitution
Aroclor 1221	21	Monochlorodiphenyl
,, 1232	32	Dichlorodiphenyl
,, 1242	42	Trichlorodiphenyl
,, 1248	48	Tetrachlorodiphenyl
,, 1254	54	Pentachlorodiphenyl
,, 1260	60	Hexachlorodiphenyl
,, 1262	62	Heptachlorodiphenyl
,, 1268	68	Octachlorodiphenyl
,, 1270	70	Nonachlorodiphenyl
,, 1271	71	Decachlorodiphenyl

TABLE II.—PHYSICAL PROPERTIES OF CHLORINATED DIPHENYLS

	Form	Acidity (Max) (Mgm KOH/Gm)	Coefficient of Expansion cc/cc/° C	Specific Gravity 25° C/25° C	Distillation Range Corr. C	Flash Point Cleveland Open Cup
Aroclor 1221	Colourless mobile oil	0·015	0·00071 (15°–40° C)	1·177 to 1·187	275°–320°	141°–150° C
Aroclor 1232	Practically colourless mobile oil	0·015	0·00073 (25°–100° C)	1·262 to 1·272	290°–325°	152°–154° C
Aroclor 1242	Practically colourless mobile oil	0·015	0·00068 (25°–65° C)	1·378 to 1·388	325°–360°	176°–180° C
Aroclor 1248	Yellow tinted mobile oil	0·015	0·00070 (25°–65° C)	1·447 to 1·457	340°–375°	193°–196° C
Aroclor 1254	Light yellow viscous oil	0·015	0·00066 (25°–65° C)	1·538 to 1·548	365°–390°	None
Aroclor 1260	Light yellow soft sticky resin	0·015	0·00067 (20°–100° C)	1·618 to 1·629	385°–420°	None
Aroclor 1262	Light yellow sticky clear resin	0·02	0·00064 (25°–65° C)	1·646 to 1·653	400°–430°	None
Aroclor 5442	Yellow transparent sticky resin	0·05	0·00123 (25°–99° C)	1·432 to 1·447	215°–300° at 4 mm Hg	247° C
Aroclor 5460	Yellow transparent resin	0·07	0·00179 (25°–124° C)	1·740 to 1·745	280°–335° at 5 mm Hg	None
Aroclor 4465	Yellow transparent brittle resin	0·05	0·00061 (25°–65° C)	1·712 to 1·723	230°–320° at 4 mm Hg	None
Aroclor 2565	Brown-black opaque resin	1·4	0·00066 (25°–65° C)	1·724 to 1·740	—	None

	Fire Point Cleveland Open Cup	Pour Point ASTMD. 97 ° C	Softening Point ASTM-E²26 ° C	Refractive Index D. Line 20° C	Viscosity Saybolt Universal Seconds		
					98·9° C	54·4° C	37·8° C
Aroclor 1221	176° C	Crystals at 1° C	—	1·617–1·618	30–31	35–37	40–42
Aroclor 1232	238° C	−35·5°	—	1·620–1·622	31–32	39–41	47–50
Aroclor 1242	None	−19°	—	1·627–1·629	34–35	49–56	80–93
Aroclor 1248	None	−7°	—	1·630–1·631	36–37	69–78	185–240
Aroclor 1254	None	10°	—	1·639–1·641	44–48	260–340	1800–2500
Aroclor 1260	None	31°	—	1·647–1·649	72–78	3200–4500	—
Aroclor 1262	None	37°	—	1·6501–1·6517	90–103	600–850 71° C	—
Aroclor 5442	>350°	46°	45°–50°	—	300–400	—	—
Aroclor 5460	None	—	100°–105·5°	1·660–1·665	—	—	—
Aroclor 4465	None	—	60°–66°	1·664–1·667	90–150 130° C	—	—
Aroclor 2565	None	—	66°–72°	—	—	—	—

As the degree of chlorination increases, there is a corresponding change in physical properties, which is typified by increasing specific gravity, boiling range and refractive index. Table II demonstrates this progressive change in characteristics. Of the compounds listed, Aroclors 1248, 1254 and 1260 are of greatest interest to the electrical engineer in their application in capacitors and transformers. Table III shows the electrical properties of these three products.

It will be seen from the table that Aroclors can with advantage replace conventional materials such as mineral oil or paraffin wax as the impregnant in paper-and-foil capacitors. Aroclor 1254 is normally used for this purpose and because of its high dielectric constant, a considerable saving in other materials is made possible. In fact, reductions in the physical size of capacitors of a given capacity of the order of 30 per cent are made possible by virtue of this fact. Such savings in space requirements are important, not only because of the economy of raw materials which they make possible, but also because of the increasing demand in the electrical industry for ever smaller components and equipment.

Employment in Capacitors

The Aroclors may be used in a.c. or d.c. capacitors, although it is customary to add a stabilizer to the impregnant in the case of d.c. capacitors in order to inhibit chemical action between the aluminium foil electrodes and the traces of hydrochloric acid which may be formed under the influence of the polarizing field.

The stabilizer commonly used for this purpose is anthraquinone, though it has been shown by Egerton and McLean[1] and Berberich and Friedman[2] that other materials such as azobenzene, azoxybenzene and benzil are also effective in diminishing the rate of deterioration of paper and foil capacitors impregnated with chlorinated hydrocarbons.

The former workers attributed this mechanism to the formation of a protective film on the surface of the aluminium electrodes[1] while the latter suggested that the stabilizers formed complexes with aluminium chloride at the points of attack and thereby prevented further decomposition.[2]

Church and Garton[3] of the E.R.A. have attributed the process of stabilization to a third mechanism, pointing out that the stabilizers so far put forward are all readily reduced by hydrogen and these materials are really hydrogen-acceptors which protect the dielectric from attack. This is borne out by the fact that a totally different class of materials from those already listed, of which octadecene is an example, is also effective.

Saving in Space

In a.c. work the great majority of capacitors for power factor correction use pentachlorodiphenyl as the impregnant. Reference has already been made in this journal[4, 5] to the great need in this country for a positive policy governing the adequate employment in industry of such devices, to limit the flow of wattless current and thereby help to ensure that all available electrical energy is employed to the best advantage.

Here the saving in space which Aroclor-impregnated units permit, compared with those using mineral oil, is of considerable advantage. They allow greater flexibility in installation of such capacitors; either in central positions, or situated throughout the works near motors, welders, chokes and similar highly inductive apparatus.

The chlorinated diphenyls are also suitable materials for use as cooling media for transformers. They have the great advantage of non-inflammability, which therefore allows the use of such equipment in any convenient place—coal mines, flats, industrial plants, telephone exchanges, department stores and even ships and aircraft—without requiring any special precautions

TABLE III.—ELECTRICAL PROPERTIES OF CERTAIN AROCLORS

Aroclor	Dielectric Constant at 1,000 c/s		Volume Resistivity Ohm-cm at 100 deg C 500 V d.c.	Dielectric Strength	Power Factor 100 deg C 1,000 c/s
	25 deg C	100 deg C			
1248	5·6	4·6	Above 500 × 10^9	Greater than 35 kV	<0·1%
1254	5·0	4·3	Above 500 × 10^9	Greater than 35 kV	<0·1%
1260	4·3	3·7	Above 500 × 10^9	Greater than 35 kV	<0·1%

against fire. The removal of this fire risk makes for considerably greater flexibility in layout of plant and associated electrical circuits and, as is already the case in the United States, should result in appreciable reductions in insurance premiums chargeable once this advantage is more generally appreciated.

It is customary to blend the Aroclor with trichlorobenzene. This material is also non-inflammable and has the added advantage of forming an eutectic mixture with the viscous Aroclor liquid, so reducing the pour point to −40 deg C.

Should a fault develop in the transformer, the only product of breakdown under arc is hydrogen chloride—or hydrochloric acid. Although this acid is corrosive it introduces no fire risk whatsoever. Mineral oil, on the other hand, is itself inflammable and when vaporized or decomposed by arcing is liable to produce explosive mixtures with air.

In normal use corona discharge may from time to time release small traces of hydrochloric acid which, over a period, may have a deleterious effect on cellulosic insulating materials and spacers. For some years before the war it was customary to use soda lime absorbers in the transformer tank to take up this acid as it was formed.

A better solution has been the introduction of a material[6, 7] which can be dissolved in the Aroclor/trichlorobenzene blend without in any way impairing its electrical characteristics; this collects any acid formed as soon as it is liberated. The material is tetraphenyl tin, which in trace amounts effectively safeguards the transformer against corrosion by acids.

Pour Point Not Critical

Certain of the Aroclors are suitable for use alone for transformer cooling. While it is not possible to obtain such a low pour point, in all other respects these grades are quite satisfactory. For instance Aroclor 1248, with a pour point of −7 deg C, is satisfactory for most purposes and especially for use indoors or underground. Even outdoors the pour point is not critical since transformers using oil with a pour point in the region of −35 deg C are sometimes exposed in arctic conditions to temperatures well below this figure, and may nevertheless be started from cold with the oil in a gelled condition.

As it becomes warm, the viscosity of the Aroclor falls quite rapidly until it will flow readily at temperatures in the neighbourhood of zero. The core losses alone of a transformer are normally sufficient to keep the Aroclor in a fluid state.

The condenser and transformer fields are applications for Aroclors of major interest in the electrical industry, but their inertness, their wide compatibility with synthetic resins and drying oils, and their outstanding insulating properties have prompted electrical engineers to experiment with these materials for fire-proofing cellulosic cable and wire insulations, joint-box compositions, for moisture-proofing small resistors and sealing small capacitors. The resinous Aroclors, 2565, 4465 and 5460, are of particular value for these purposes, in combination with bitumen for joint-box compounds, or linseed oil for proofings or with waxes such as paraffin wax for sealers and moisture-proof coatings.

Use for Plasticizing

In addition, Aroclor 1254 is of interest as a plasticizer/extender for dioctyl phthalate for use with polyvinyl chloride. Apart from the fact that the Aroclors will help to alleviate the shortage of suitable primary plasticizers for p.v.c., which, it is apparent, will continue for some years, they will contribute to reducing the "flame-out" time of plasticized p.v.c. compositions. Typical compositions based on p.v.c./dioctyl phthalate on the one hand and p.v.c./dioctyl phthalate/Aroclor on the other, gave "flame-out" times of 76 sec and 3 sec respectively.

It will be apparent from a consideration of the properties of the chlorinated diphenyls in relation to the problems of the electrical industry that the establishment of manufacture in Great Britain of these versatile materials will make an important contribution to the continued progress of this industry. They emphasize once again the the important function of the chemical industry as a producer of synthetic products which overcome the limitations of natural products and progressively supersede them.

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[7] British Patent No. 594,655.

Avoiding Load Shedding

Plans for Meeting the Coming Winter's Power Shortage

PROPOSALS accepted by the Government for meeting an anticipated deficiency in electricity generating capacity in the coming winter are outlined in a report published last week by the Electricity Sub-Committee of the Joint Consultative Committee of the National Joint Industrial Council. At a Press conference Sir Robert Gould, chairman of the Sub-Committee, described the position as being more serious than any with which the Sub-Committee had had to deal since 1947. Arrangements such as had been made last year were quite inadequate to meet the situation and more drastic measures would have to be taken if load shedding with its resulting dislocation of industry, higher costs and higher prices was to be avoided.

Although new generating plant is being brought into operation on an ever increasing scale, the excess of demand over supply continues to grow. The British Electricity Authority estimates that the total potential demand of all consumers of electricity at the winter peak is likely to be 13,800 MW in average weather, 14,400 MW in an average cold spell and 15,100 MW in severe weather. It is pointed out, however, that these figures must be subject to upward revision in the event of any dislocation of domestic solid fuel supplies.

Output Capacity

It is expected that the maximum output capacity of the B.E.A. will increase in 1951 by 900 MW, after taking into account the probable loss of capacity owing to old plant becoming unusable. By mid-December plant capacity is estimated at 12,000 MW, rising to 12,200 MW in February. On this basis the probable gap between supply and demand at the peak will be about 1,800 MW in average weather conditions, 2,400 MW in cold spells and perhaps as much as 3,100 MW in extremely severe weather.

In the light of this forecast it is clear that whatever the weather conditions the resultant situation will be beyond the capacity of industry to deal with alone. This makes it more imperative than ever that every class of consumer should help in securing a reduction in demand at peak hours. It is emphasized that when load shedding occurs all classes are affected not only by the load shedding itself but by the consequences of the stoppage of production. If load shedding occurs on an extensive scale employment will be affected, earnings will be reduced and less money will be available to the household and for spending.

Regional Committees

To secure full co-operation of all classes of consumers a meeting was therefore called by the Minister of Fuel and Power of all the various bodies representing the different classes of consumers. At this conference held on 26th July it was decided to set up Regional Committees with a view to obtaining the maximum co-operation of the domestic consumer and the small commercial consumer.

After making allowances for frequency and voltage reductions, which in the circumstances must be regarded as inevitable, there remains an overall deficit of 1,200 to 1,300 MW. Last year arrangements operated by industry were estimated to have secured a reduction in simultaneous national demand of 300 MW; in the previous winter the corresponding reduction was about 500 MW. The Sub-Committee feels that the target set for industry during the coming winter cannot be less than the latter figure and should indeed be 600 MW. On the basis of previous experience the figure of 600 MW could be reached if industry set out to achieve a 20 per cent reduction in the industrial demand that would have been made last winter if there had been no reduction by load spreading. This leaves at least another 600 MW reduction to be achieved by other means.

The importance to industry of avoiding load shedding cannot be over-emphasized but a proper balance must be maintained.

The Sub-Committee aims at securing the maximum reduction by industry without a disproportionate dislocation of production that would nullify the results that it is hoped to achieve. In the view of the Sub-Committee the target of 600 MW represents that amount of peak load reduction which industry can be asked to contribute if such dislocation can be avoided. Furthermore, this target may be taken as representing the proportion of the deficit attributable to the industrial load, which constitutes half of the total load.

Peak Demand Periods

The Sub-Committee recommends that any arrangements for load spreading should be planned on the basis of periods of peak demand continuing from 8 a.m. to noon and from 4 to 5.30 p.m. from Monday to Friday inclusive during the five months November to March. Last winter the critical hours were from 8 to 9 a.m. in December, January and February and from 4 to 5.30 p.m. from December to mid-January.

While appreciating the inconvenience, loss of amenities and increased cost of production, the Sub-Committee sees no way of securing adequate means of avoiding load shedding that does not involve some adjustment of the customary hours of work, whether by the simple alteration of working hours, the introduction of double shifts or a considerable switch to night work. Both the British Employers' Confederation and the General Council of the Trades Union Congress have indicated their readiness to do all within their power to assist in any arrangements of this kind.

Auxiliary Plant

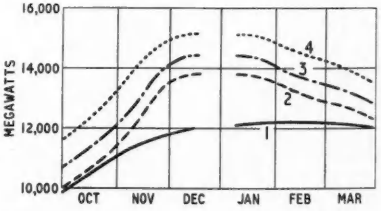
With regard to the possibility of reducing maximum load by using auxiliary generating plant, it is stated that the B.E.A. and the Area Boards have already waived objections to the installation of such plant.

The B.E.A. has assured the Sub-Committee that it is fully alive to the importance of warning consumers of impending power cuts. In addition to the general broadcast warnings by the B.B.C. and the use of the normal telephone facilities to the maximum practicable extent two other methods of warning industrial consumers are being actively investigated, namely private short-wave radio transmission and radio transmission services over the Post Office networks. Regional Boards for Industry will again be responsible for securing the co-operation of industry and large industrial commercial undertakings in implementing the recommendations. The position may vary from Region to Region according to local circumstances but each Region must endeavour to reach its appropriate target. An exception is, however, made with regard to Scotland where it is expected that the installation of new steam plant coupled with additional supplies from the North of Scotland Hydro-Electric Board will reduce the plant deficit considerably compared with last winter. The extent to which power can be exported from Scotland in order to give relief to other areas, however, is limited by the capacity of the transmission lines.

An appendix to the Report contains a report of the B.E.A. to the Sub-Committee, including diagrams showing the actual and estimated plant and potential demands for different weather conditions and MWh lost through load shedding.

B.E.A. Report

The B.E.A. report states that during last winter the highest potential demand was made on Monday, 18th December. The load met by the available plant was 11,242 MW and the estimated load relief obtained by voltage and frequency reduction and by disconnecting supplies was 2,215 MW and by load spreading 300 MW. The estimated unrestricted potential demand was 13,757 MW which, although the weather was not severe, exceeded the severe-weather estimate of unrestricted potential demand by 57 MW. The B.E.A. considers that the future load-spreading



Estimated plant/load position October, 1951, to March, 1952, with different weather conditions.

1. Available plant capacity. 2. Demand in average winter weather. 3. Demand with average expectation of cold weather. 4. Demand in extreme cold weather.

arrangements should therefore cater for worse weather conditions than the average winter conditions considered appropriate by the Sub-Committee in previous years.

Mr. Noel-Baker's Statement

In a statement following the publication of the report, Mr. P. Noel-Baker (Minister of Fuel and Power) said that during the first thirteen weeks of this summer, the British Electricity Authority had sent out 17·7 per cent more electricity than in the corresponding period of last year. The increase in the last three years had been 32·5 per cent. Three-fifths of the increase had been for industry, and much of the rest for commerce. The B.E.A. could easily meet this rapidly increasing demand if it were spread evenly over the twenty-four hours. Following the recommendations of the Gould Committee to Industry, he had urged on representatives of commerce and of domestic users that everyone should co-operate to spread the load over more hours of the day. Load spreading meant some readjustment of working hours, and some inconvenience; but the inconvenience was much less than that caused by power cuts, and the nation gained instead of making a heavy loss. But other measures were required besides load spreading, and they would be taken.

In spite of national difficulties of capital investment, the expansion of generating capacity must go on. The highest increase in one year before the war was 675 MW in 1937; in 1950 it was 965 MW, this year it would be 1,100 MW. Capital would be provided for 1,400 MW in 1953; for 1,450 MW in 1954; and for 1,550 MW in 1955.

Overhaul of Boilers

Arrangements were being made to mitigate the effects of regulations which prescribed the overhaul of boilers at given intervals of time. It had been agreed in principle that the regulations should not be applied to new boilers in B.E.A. power stations, where exemptions could be safely allowed; if the details could be worked out, this might make an important additional contribution in the winter months.

He hoped that industrialists would use their standby generating plant right through the winter; the B.E.A. had reached agreement with the Federation of British Industries about the financial and other terms which would encourage industrialists to do this. Power station coal stocks were being built up extremely well; allowing for a higher rate of winter consumption, they were better than they had ever been at this time of the year.

Fuel Resources Committee

LAST Friday the Minister of Fuel and Power (Mr. P. Noel-Baker) announced the appointment of a committee to consider whether further steps can be taken to promote the best use of the country's fuel and power resources having regard to present and prospective requirements and technical developments.

The chairman is Viscount Ridley, a member of the former Fuel and Power Advisory Council and the other members are Mr. N. W. Gardiner (technical director, Huntley & Palmers, Ltd.), Sir Claude Gibb (chairman and managing director, C. A. Parsons & Co., Ltd.), Professor W. R. Hawthorne (Professor of Applied Thermodynamics, Cambridge University), Professor W. A. Lewis (Professor of Political Economy, Manchester University), Mrs. M. Mackintosh (tutor in sociology, Bedford College, London) and Miss M. R. Schofield (housing manager, Stoke Newington Borough Council).

In making his announcement Mr. Noel-Baker said that from a pre-war five-year average of 178 million tons the annual internal consumption of coal had risen to 202 million tons in 1950, despite the lower supplies to households; this year it might reach 210 million tons. Electricity sent out had risen by 50 per cent since 1946; gas output by 25 per cent; and oil consumption by 90 per cent.

Street Lighting

INTIMATION has been given to the BOURNEMOUTH Corporation Highways and Works Committee that the Ministry of Local Government and Planning has been recommended to issue consent to a loan of £5,174 for improved street lighting in Alma, Richmond Park and Hinton Roads and Queen's Park Avenue.

COVENTRY Corporation Road Safety Committee has considered a report of the city engineer upon the desirability of proceeding with the first stage of the scheme for the conversion of street lighting from gas to electricity. The estimated cost of this first stage amounts to £18,250, made up as follows:—250 tungsten filament lamps, £3,875; 750 mercury discharge lamps, £13,875; and additional lamp standards as required, £500. It is hoped to begin the conversion work during August and to complete the first stage before the beginning of April, 1952.

VIEWS on the NEWS

By REFLECTOR

THOSE who actually saw the Duke of Edinburgh deliver his presidential address to the British Association, or saw the film televised by the B.B.C., will not accuse me of being fulsome when I say that it was a superb performance. The Duke had a confident forthright manner which showed clearly that he knew what he was talking about. The matter, too, was well put together and constituted an excellent review of British contributions to the advancement of science. One or two sly digs at the scientists, by which the Duke emphasized that he spoke as a layman, were much appreciated by his victims.

* * *

I hope that the introduction by the Southern Electricity Board of the new block tariff for domestic consumers does not presage a new era of bricked up windows such as followed the introduction of the window tax at the end of the 17th century. According to the schedule, store rooms, box rooms and cellars are not regarded as assessable rooms if they are without external windows. Apart from the question of what comprises a store room or a box room, I cannot see that there could be any objection to blocking up a window and perhaps even replacing it by an artificially illuminated one; except, of course, that the cost of the structural alterations, the extra lamps and a greater electricity consumption would make it a doubtful proposition financially.

* * *

A recent statement in the House of Commons that at the present rate of consumption the world's lead would be exhausted in fifteen years may have been "alarmist" but there is no doubt that demand is at present ahead of production. Therefore any possible augmentation of supplies must be seriously studied. Most of the lead deposits in Great Britain are either exhausted or it has become too expensive to work them. Nevertheless the price to which lead has attained has changed the situation and lead mining here may again become economic. I am impelled to make these remarks by a report from Scotland that private concerns are to undertake exploratory work in the Leadhills—Wanlockhead area of South Lanarkshire and North Dumfriesshire. This used to be a lead and zinc producing area but working was discontinued between fifteen and twenty years ago. Now, with a supply of electricity available, the prospects of re-opening the mines are improved.

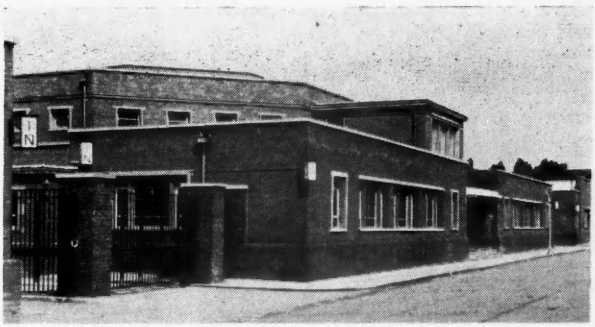
* * *

A resolution has been passed by the Commercial Committee of the National Farmers' Union expressing "grave concern" at the increased evidence of a falling-off in the number of rural connections and the threat of complete cessation of rural programmes of electrification if any further cuts in the capital investment programme should fall entirely on this section. It was reported by a number of members that rural electrification in their areas was virtually at a standstill. It is most unfortunate that the Electricity Boards should be compelled to delay or suspend this very desirable development but I suppose their view is that for the same expenditure it is possible to connect a great many more urban consumers. With capital expenditure restricted they must have regard to the greatest good of the greatest number.

* * *

My recent remarks about the theft abroad of overhead conductors and underground cables for the sake of the copper may have put ideas into people's heads in this country. I felt a bit guilty when I heard that about a mile and a half of copper wire had been stolen from telegraph poles on Port Hill, Marlborough. I shall only make matters worse, I suppose, if I draw attention to the risk of going on holiday and leaving one's electrical and telephone wiring installations unattended.

Crewe Cattle Market



Panel Heating Among Many Electrical Features

A NEW attested cattle market which Henry Manley & Sons, Ltd., have opened at Crewe is almost certainly the most modern establishment of its kind in the world and is likely to prove a model for similar installations. Apart from byre accommodation for 450 attested cattle, the premises include a sales ring, a restaurant, kitchen, banking hall, etc.

The numerous features of electrical interest embodied in the new building include electric space heating, primarily by low temperature panels, and an electric thermal storage water heating system serving the kitchen, toilets and cattle washing area, all designed for off-peak operation. The lighting arrangements too are noteworthy not only for their efficiency but also for decorative effect.

The market stands in Barker Street on a 47,020 sq ft site of which 31,500 sq ft is occupied by buildings. In the centre of the 300ft frontage is the entrance for the buyers leading to the sales ring, while on each side are wide double gates for " in " and " out " cattle traffic to the reception yards, which incidentally are floodlighted by Veritys wellglass fittings to facilitate night work. A system of tubular metal barriers and gates simplifies segregation of the cattle and routing to the appropriate stall in the three byres.

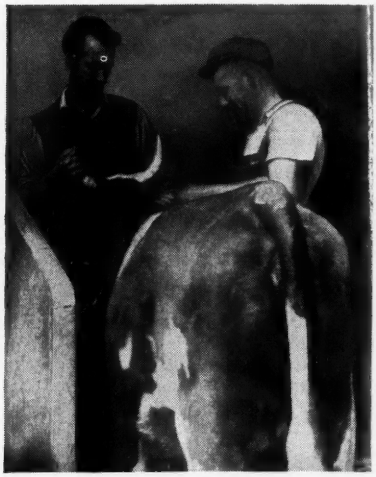
Completely separated from the sales ring block, these byres occupy the whole of the back portion of the site and part of the two sides, the remainder of which is taken up by the herdsmen's canteen, dairy, food stores, lavatories, etc.

On one side of the main entrance hall is a dining room and on the other a lounge,

Above: **Front of the new Crewe cattle market.** *Left:* **One of the byres showing lighting arrangements and also suspended plug sockets for the portable milker, clippers, etc.**

which is also used as a property sales room and for farmers' meetings. Each of these rooms is illuminated by ten attractive pendant fittings (made by Geo. Forrest & Sons, Ltd.) each containing three 100 W lamps. Low temperature heating panels supplied by Electric Panels, Ltd., have been incorporated in the walls of these rooms, in the herdsmen's canteen and in the various offices, ceiling panels being employed in the entrance hall and in the crush hall above it which overlooks the sales ring. The panels are loaded to approximately 20 W per sq ft and are automatically controlled by Heatovent thermostats and Londex relays. Tubular heaters are fitted in the lavatories. Altogether the total connected heating load is 55·42 kW.

The entrance hall leads into a foyer which gives access not only to the sales ring but also to offices, cloakrooms and kitchen. A pleasing architectural effect is produced in both the entrance hall and foyer by the use of trough lighting and all direction signs are indirectly lighted. In the sales room, which is hexagonal in shape and accommodates a thousand persons, twelve Revo pendant lighting fittings housing 300 W lamps provide well diffused illumination of high intensity over the whole of the floor area. Supplementary lighting for the use of the auctioneer comes from a striplight concealed in the canopy of his rostrum. Further facilities for lighting or the use of other electrical appliances are available in the rostrum, as well as in the crush hall, dining room and lounge, by the provision in each instance of two 15 A switch sockets.

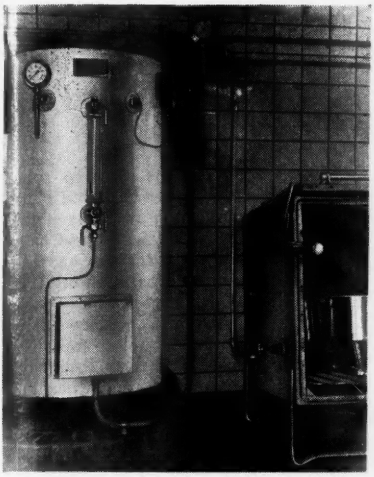


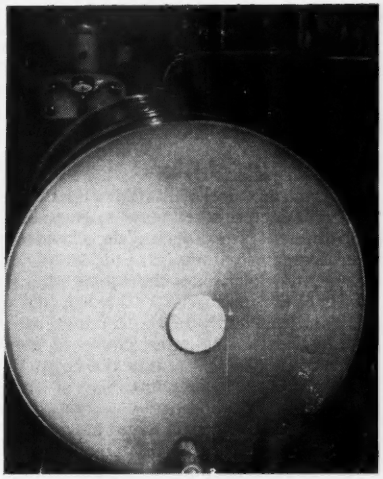
Provision is made for the use of cattle clippers

Five Smiths' electric clocks of designs appropriate to their surroundings have been installed in the sales ring, lounge, dining room, office and kitchen. Electrical equipment of the kitchen also includes a Hobart potato peeler and a " Prestcold " refrigerator, the lighting coming from totally enclosed spherical pendants.

Water heating throughout the building, except in the case of one lavatory, is carried out electrically by means of Santon thermal storage units, time switch controlled

Left: **Cornice lighting produces a pleasing architectural effect in the foyer.** *Right:* **The lounge is heated by thermostatically controlled electric wall panels, attractive pendants being used for the lighting**



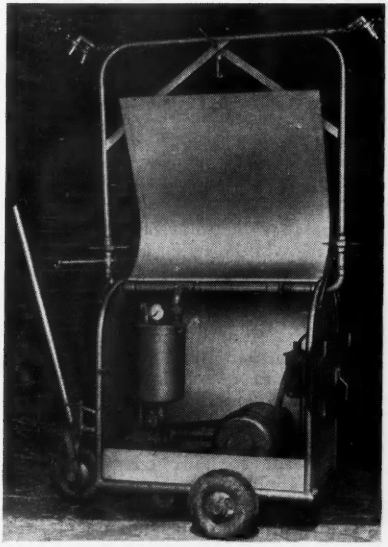


Above left: **Bastian & Allen 9 kW electrode steam raiser for supplying steam for the sterilizing chest and milking clusters.** *Right:* **One of the two 80 gall 12 kW thermal storage water heaters, arranged for off-peak operation, to supply the byres, etc. The pump for supplying high pressure water for washing down is seen in the background.** *Below:* **This Fullwood four-bucket portable milker is operated by a 1½ h.p. motor**

to operate at off-peak periods. To supply hot water two 80 gall 12 kW units have been installed in compartments under the seats of the sales ring, one on each side. In each of these compartments also is a Laycock pump driven by a Brook 5 h.p. motor with Brook starter and Sanders "Superior" switch. These pumps each deliver 4 gall of water a minute at a 400 lb/sq in pressure which enables every portion of the buildings and the cattle yards to be reached from one or other of the thirteen pressure points.

To serve the men's lavatory there is a 30 gall 1½ kW heater, while an 80 gall 6 kW unit covers the requirements of both the ladies' lavatory and the kitchen. A G.E.C. 3 gall 1 kW heater supplies the washbasin in the dairy toilet.

A Fullwood four-bucket portable milker (with a Crompton Parkinson 1½ h.p. motor) has been provided and the equipment of the dairy includes a Bastian & Allen 9 kW electrode steam raiser for supplying steam for a sterilizing chest and milking clusters. For the milking machine and also for the use of clippers, etc., Reyrolle 20 A waterproof sockets are suspended from the roof at intervals down the centre of the byres. To prevent accidental switching on or off by the cattle turn-button switches are used for controlling the lighting of the byres. The complete electrical installation was carried out by Matthew Hall & Co., Ltd.



Engineering in Europe

Survey of Current Literature

THERE is a fairly widely held opinion that in mixtures of insulating oils of different degrees of refinement corresponding to different rates of ageing, the oil with the lower degree of refinement, thus the higher ageing rate, determines the ageing characteristics of the mixture. This is believed to apply independently of the mixture ratio, so that even a small percentage of more rapidly ageing oil will reduce the durability of a mixture, the main component of which has good lasting properties.

Comprehensive tests have now shown that too high a degree of refinement also reduced durability and resistance to oxidation, but that it can be corrected by mixing over-refined oil with an oil of the optimum degree of refinement. The tests were made by the method of the tar number, modified by the author, and by Baader's method, standardized by the German regulations VDE/0370/5. They confirmed the fact that commercial oils of comparatively low durability may be brought up to a satisfactory ageing rate by admixtures of even as little as 10 per cent of an oil of good ageing properties.

Obviously this result is not general and is conditional upon the affinity of the mixed oils (they must have the same base, e.g., naphthalene). On an average, the poorer component will deteriorate the durability of the mixture. The author presents a theory of the " mechanism " of the improvement effect discovered by him.—" Ageing Tendency of Mixtures of New Insulating Oils," F. Skala, *E.u.M.*, Vol. 68, pp. 313–317, 1st July, 1951, in German.

Tinning Conductors

Schurmann and Blumenthal's tinning test consists in immersing the tinned conductor in a solution of ammonium persulphate which attacks the untinned places of the copper conductor and dissolves it, forming a blue cupric-ammoniacal complex compound which may be analysed by colorimetry. As the dissolution rate of the copper, or copper quantity dissolved, depends on the diffusion of the copper ions into the solution and of oxidizing ions towards the metal, a constant diffusion layer must be obtained lest a local saturation in cupric salts or impoverishment in oxidizing ions in the liquid layer near the metal should vitiate the result. The indispensable test conditions have been determined by analysing the effect of the various factors contributing to the stability and reproducibility of the test results and established the paramount influence of permanent stirring.—" Tinning Test of Tinned Copper Conductors," M. Zurcher and J. Luder, *A.S.E. Bulletin*, Vol. 42, No. 8, pp. 271–275, 21st April, 1951, in French.

Wind Power

The parallel operation of wind power stations with existing systems supplied by large thermal and/or hydro-electric power stations is more or less the central problem of the rational use of wind power; only its final and fool-proof solution would justify the erection of numbers of large wind power stations. The authors of this article had in a previous paper theoretically proved the possibility of stable parallel operation between a synchronous alternator directly coupled with a wind turbine and now report on their experiments with a 40 kVA/380 V, 1,000 r.p.m. synchronous generator driven by a D-18 wind turbine, a type widely used for individual wind power stations in the U.S.S.R. The generator worked with a step-up transformer on a 6 kV experimental line of 1 km length.

The D-18 wind turbine has a variable-pitch propeller for speed control by centrifugal governor. The experiments showed that the latter is useless for keeping the machine at synchronous speed because after a first regulation of the propeller pitch to produce the speed of the wind wheel corresponding to synchronous speed at the instantaneous wind speed, the governor would not act on further wind variations. However, the centrifugal governor is useful as an excess-torque limiter. It was then found that on principle self-synchronization

of the generator is possible and with a very simple installation. The test results are given in tables and oscillograms.—" On the Parallel Operation of Wind Power Stations with a large Power System," V. N. Andrianov and D. N. Bystritskii, *Elektrichestvo*, No. 5, pp. 8–12, May, 1951, in Russian.

Insulator Variations

Comprehensive tests on thermal stressing of overhead line insulators have been carried out throughout the French grid with special attention devoted to seasonal influences and of the heights of the lines (which included sections in the Alps and Pyrenees). The effect of the altitude on the thermal shocks was very marked, whereas no distinct influence of the seasons could be established. For instance, the highest probability of the occurrence of thermal shocks exists on days with intermittently clouded skies, but the incidence of such days is approximately equal throughout the year, at least for the main climatic zones. On the other hand, there are neither great differences between the ambient temperature and the temperature of the porcelain insulators, nor—at least for conditions obtaining in France—what could really be called temperature shocks, that is very rapid rises or falls of the temperature of the insulators.

One conclusion to be drawn is that the immersion tests prescribed by the French regulations (temperature testing) produce thermal shocks not likely ever to be produced naturally in the operation of overhead lines.—" Influence of Atmospheric Conditions on the Temperature Variations of Insulators," P. Scauepp and L. Gion, *R.G.E.*, Vol. 60, pp. 217–234, June, 1951, in French.

Power Line Interference

This article is an analysis of the various effects of h.v. on communication lines in great detail, namely, galvanic, capacitive, inductive and electrostatic phenomena, and their special forms according to the character of the communication system involved (l.f., m.f., h.f.). No fatal accident by interference with communication lines has yet been reported. An account is included of full-scale experiments made by the Austrian Post and Telegraph Administration jointly with one of the big Austrian power companies. Experimental communication lines were built, one crossing a 220 kV duplex line at an angle of 30 deg and the other at an angle of 90 deg. The overhead line was operated in the first part of the tests as a single system only and without load; in the second part of the tests it had an artificial single-phase fault to earth at 185 kV. In the first case a static voltage of 825 V was registered, during the earth fault 1,014 V, but the corresponding power readings were only 30–600 mVA.

The physiological effect of a contact with conductors of the communication lines was comparable to the prickle experienced under d'Arsonval treatment. The static potentials could be reduced by the arrangement of earth wires by 20 per cent for one earth wire and by 75 per cent by four wires (cage). For parallel lines the highest induced voltage measured in normal operating conditions was 250 V. Only a double-phase fault to earth may induce voltages up to 2,000 V; however, this is not only a very rare occurrence, but also would last only an instant.—" Interference with Communication Lines at Approaches to and Crossing with H.V. Transmission Lines," F. Kerkoszek, *O.T.F.*, Vol. 5, No. 314, pp. 43–51, March/April, 1951, in German.

Quenching Rectifier Short-Circuits

The method of quenching external or internal short-circuits in rectifiers by a grid with a negative bias with respect to the cathode was developed by Brown-Boveri and is now quite generally used. External short-circuits can be quenched " normally " in less than a period of the a.c. input cycle if $\omega L/r < 3{\cdot}64$, where L is the filter inductance, r the short-circuit current—limiting resistance, ω the cyclic frequency of the mains. This condition is generally satisfied in practice. If $\omega L/r > 3{\cdot}64$, " abnormal " quenching within 2, 3, 4 periods takes place; the conditions of this occurrence can also be specified, but in fact abnormal quenchings are even more harmless than normal quenchings because the over-currents have far smaller amplitudes than the current peak of a " normally " quenched short-circuit.

These results, obtained by a very simple equivalent circuit, apply approximately to plant including filter capacitors. Internal short-circuits in the rectifier are quenched after the natural extinction of the anomalous cathode spot that appears on a failing anode; after this extinction there may even

be a transitory period of normal operation of the anode concerned. The blocking of the other anodes by their grids then prevents their operation and the return of the back-voltage to the failing anode. Yet this blocking effect is conditional upon the deionization period of the anodes being sufficiently long (120 to 150 electrical degrees).

This is where the multiple-anode rectifiers are at a distinct advantage over the single-anode types, in which the short-circuit arc always affects the two cathodes, evaporates a considerable quantity of mercury, increases the pressure and draws out the deionization period, whereas in the multiple-anode rectifier the short-circuit arc passes from one anode to the other without appreciable evaporation of mercury.—"The Mechanism of Quenching Short-Circuits in Rectifiers by Grids," M. Demontvignier, *R.G.E.*, Vol. 60, No. 4, pp. 147–154, April, 1951, in French.

Line Voltage Unbalance

The connection of a single-phase load into a three-phase system produces an inverse voltage component in the system if the load is connected between two phase conductors, and inverse and homopolar components if the load is connected between phase and neutral. The inverse voltage component is the maximum at the point of connection of the load to the system and falls slowly towards the load, more rapidly towards the power station. This decrease is a function of the line and transformer impedances interposed. The percentage unbalance is defined as 100 × apparent single-phase power/transient three-phase power on short-circuit, and therefore becomes smaller with approach to the power station, with increasing transmission voltage and with increasing p.f. of the load.

The paper gives the theory of the solution of such unbalance problems by network analyzer in which the three systems of components (direct, inverse and homopolar) are modelled. Two methods, the "classical" and a new method, are demonstrated on a multitude of cases of possible connections between loads and system, including several points of unbalance. The new method was actually used for analyzing severe unbalances introduced by a single-phase traction system of a railway in the Belgian Congo. Finally, a new and compendious instrument for measuring inverse voltages is described.—"Calculation and Measurement of the Voltage-Unbalance in Polyphase Transmission and Distribution Systems Comprising Single-Phase Loads," A. Dejou, P. Gaussens and CH. Hoeffer, *R.G.E.*, Vol. 60, No. 4, pp. 155–164, April, 1951, in French.

[Readers may arrange, by request, to obtain accurate full translations of any of the articles abstracted in this section, at the usual rates.—Editors, *Electrical Review*.]

Welding Research

Association's Annual Report

AT the sixth annual general meeting of the British Welding Research Association which was held at the research station, Abington, near Cambridge, on 25th July, the report of the Council, statement of accounts and balance sheet at 31st March, 1951, were adopted.

Sir Charles Lillicrap, chairman of the Council, reported a satisfactory year's work by the various Research Committees and a continued increase in membership. It was becoming increasingly evident that industry was taking advantage of the resources and accumulated knowledge of the B.W.R.A. The recent summer school at Ashorne Hill was so successful that tentative plans were being made for a similar course to be held next year. The liaison staff backed by the investigators had been receiving more calls than heretofore for advice from members and non-members, and translating highly technical data into workshop practice. This important task of bridging the gap between the research laboratory and workshop served a basic object of the Association.

The Council, bearing in mind the capital commitments involved in purchasing plant and building a laboratory, had transferred to reserves the sum of £2,400 and was encouraged by the response of members who had contributed towards the cost. The chairman's appeal of April last had brought in over £2,000 and this money would help provide for the testing plant which was so necessary for the research programme.

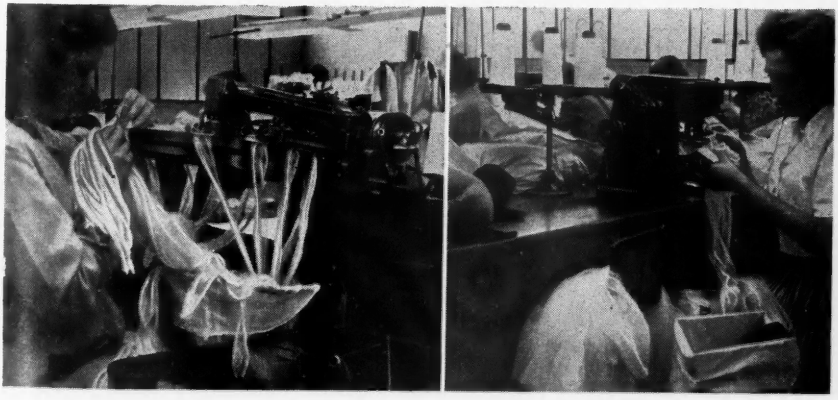
During the year the Association was honoured by the choice of the director as the leader of the specialist team on welding which visited the United States under the auspices of the Anglo-American Council on Productivity.

A portion of the knitting room showing fluorescent lighting over the machines

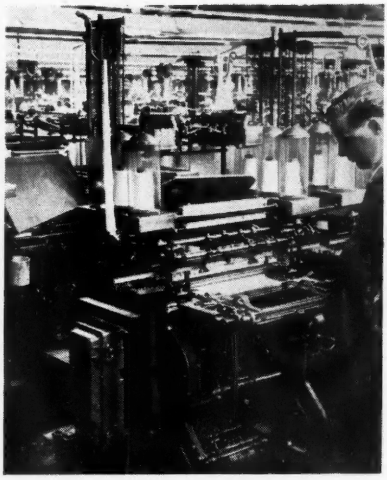
Nylon Stockings

Production at a New Factory in Northern Ireland

RATHER over two years ago we had the opportunity of spending a week touring Northern Ireland to see how the coming of electricity had made possible the establishment of a number of new industries. Recently we paid a return visit there for the purpose of inspecting a number of other new factories which depend in a variety of ways on the utilization of electricity.



Linking the toe portion of the stockings and (*right*) seaming up the back of the leg



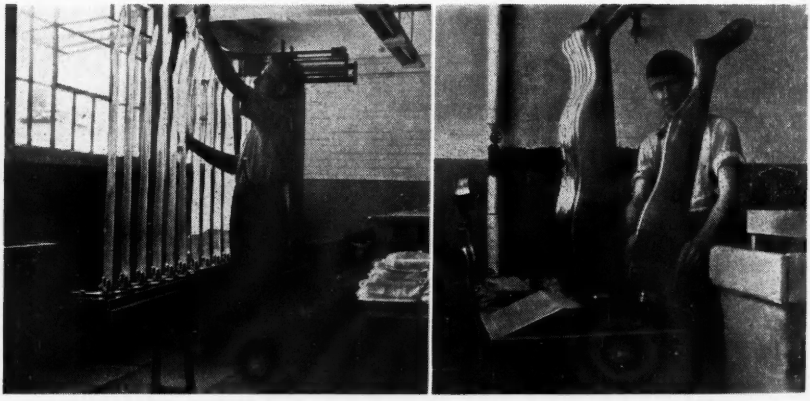
One of the knitting machines

Since we last visited Taylor-Woods, Ltd., at Enniskillen (*Electrical Review*, 1st April, 1949), the company has transferred its manufacture of nylon stockings from its temporary premises in an old gaol to a completely new building with about five times the production space, all of which is on one floor. Though not yet working to full capacity—there are still some more machines to be installed—the new factory, working on a three 8-hour shift system, is already turning out 3,400 dozen pairs of stockings a week and providing work for about 450 employees, of whom 275 are men.

Both the methods and machinery employed are of the most up-to-date and special importance is attached to motion study, including the use of films. Compared with the hundred knitting machines installed at the old works, there are now 425 in use. These are the latest Wildman single head fully fashioned knitting machines, approximately half being 54 gauge units (i.e., having 54 needles per 1½in) and the remainder 66 gauge units.

Designed for dealing respectively with 15 and 30 denier yarn, these machines do 74 courses a minute, and each produces a stocking in about half an hour. Operation is fully automatic, including resetting after the completion of each stocking. Groups of up to sixteen of these machines are driven through vee belts and line shafting by means of Hugh J. Scott 1½ h.p. motors equipped with Donovan starters. Altogether thirty-two rows of machines have so far been installed in the factory.

In the next operation, linking or looping, the toe portion of the stocking is turned over and stitched to form a pocket, two banks of nine linking machines being used for this purpose, each driven by a 1½ h.p. motor. Seaming machines, of which there are forty-five driven in groups of about six by 1½ h.p. motors, carry on the process by stitching from the pocket right up the back of the leg. Inspection then takes place on forms expanded by compressed air, causing any fault to reveal itself. Automatic



Left: **Electrically operated preboarding machine.** *Right:* **In the boarding machines the legs are brought forward in turn by touching a switchbar**

counters ring bells as every twenty-fourth stocking is placed on the collecting stand. Minor imperfections are rectified by mending machines.

Preboarding or shaping the stockings before dyeing is undertaken on two types of machine. In the "Turbo" type preboarder, incorporating two ¾ h.p. motors and automatically controlled with the aid of solenoids, eighteen stockings at a time are brought (by steam at 30 lb/sq in pressure) up to 274 deg F. At this temperature, at which it is held for three minutes, nylon being thermoplastic sets to the form of the metal leg shapes. The other type of machine, which incorporates a 1½ h.p. motor and requires a certain amount of manual operation, accommodates twenty-four stockings at once but takes slightly longer.

In the dyehouse the stockings are scoured and cleaned before dyeing. The dyeing drums are arranged so that the agitators reverse direction every twenty seconds to give perfect penetration of the dyestuffs.

Duly dyed and dried the stockings pass on to the boarding room where the shaping operation is completed on steam heated forms. Each of the five machines installed embodies twelve legs grouped close together and the operator brings each one forward in turn, for putting on or removing the stocking, by touching a switchbar. Each machine is operated by a separate ½ h.p. motor.

After pairing and inspection, the stockings are marked by means of an electric transfer iron. This is thermostatically controlled at approximately 300 deg F, the temperature being important since if it is not high enough the transfer will not come off while if it is too high the nylon will be melted. Bagging in "Pliofilm" envelopes and packing in cardboard cartons make the stockings ready for despatch.

Air conditioning plays a considerable part in the successful operation of the factory and it is endeavoured to run the plant at within ± 1 deg F of the desired temperature (74 to 76 deg F) and within ± 3 per cent of the desired humidity of 52 per cent. The Musgrave air conditioning plant comprises two identical sets serving the two halves of the factory. Mawdsley's motors are used to drive the washing and scrubbing plant, while Crompton Parkinson 75 h.p. motors with Allen West starters drive both the inlet and exhaust fans. Control of the air conditioning is effected by means of Watford equipment, the switchgear being supplied by the English Electric Co., Ltd. Fluorescent lighting has been adopted throughout the factory, Revo equipment having been selected. The electrical installation work was carried out by B. French, Ltd., of Belfast.

Marking with a thermostatically controlled transfer iron

Indian Lampholders

THE Government of India has studied the report of the Tariff Board on an application by Indian makers of brass electric lampholders for increased protection and has issued its decisions. The Board recommended the imposition of a protective duty of 45 per cent *ad valorem* on imported brass lampholders but the Government considers that the existing rate of duty is sufficient protection. Other recommendations, which are accepted, relate to the continued purchase of Indian lampholders by Government Departments and the railways, the supply of brass sheet directly to the industry by Indian manufacturers, the improvement of the quality of porcelains supplied, the high labour cost per unit and the necessity for training labour and modernizing equipment. Reports received by the Government show that the quality of Indian brass lampholders is reasonably satisfactory but that there is scope for an improvement in quality.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN the sixth examination under the diploma scheme of the **Association of Supervising Electrical Engineers** held in various centres on 23rd and 24th May last, the following candidates were successful and have been awarded the Swann Diploma :—Electrical Installation Practice : Messrs. G. A. Merritt, Ewell, Epsom, M. T. O'Brien, Plymouth, and A. G. Rutherford, Cupar, Fife. A number of candidates passed Part (1) of the examination only. An announcement in respect of the 1952 examination will be made in November next.

Mr. A. J. Hansell, Newcastle manager of Thomson & Brown Brothers, Ltd., has retired from active management, and has been succeeded by **Mr. G. Urwin.** Traders and friends in the Newcastle area recently gave a lunch to Mr. Hansell at which a presentation was made to him. Mr. Hansell has now joined the board of the company in a consultative capacity.

Two new appointments among their technical staff have just been announced by United Ebonite & Lorival, Ltd., Little Lever, near Bolton. **Mr. G. F. Sly,** formerly chief designer, has been promoted to the position of assistant to the works manager, Mr. F. E. Lowe, and **Mr. J. Kirkpatrick,** formerly Mr.

Mr. G. F. Sly

Mr. J. Kirkpatrick

Sly's assistant, has been appointed chief designer in his stead. With five years' previous experience in the plastics industry, Mr. Sly joined Lorival in 1939 as tool designer responsible for the organization of the drawing office, the tool room and tool control. In his new post he will be engaged mainly on administrative duties. Mr. Sly is a member of several technical committees.

Mr. Kirkpatrick joined Lorival from technical college at the age of sixteen and progressed steadily upwards through various responsible positions in the drawing office until he was finally appointed assistant to Mr. Sly in 1949.

Mr. P. S. Barton, F.I.E.S., who has been general sales manager of Courtney, Pope (Electrical), Ltd., for the last two years and was previously with the Benjamin Electric, Ltd., for twenty years, has decided to settle in New Zealand. He is due to sail for Auckland in September. Mr. Barton is a fellow of the Incorporated Sales Managers' Association and has been hon. treasurer to the London Branch and a member of the Council for a number of years. He has acquired agencies for a number of British manufacturers who wish to increase their exports to New Zealand. Mr. Barton's home address is 43, Quakers Lane, Potters Bar, Middlesex.

Mr. P. S. Barton

The officials and staff of the South Shields offices of the North Eastern Electricity Board have presented a gold watch to **Mr. G. H. Dale,** district engineer at South Shields, to mark his retirement. The presentation was made by Mr. E. C. Lennox, manager of the North Eastern Electricity Board (Wear Sub-Area).

Mr. James D. D. Shaw has been elected to the board of Duncan Watson (Electrical Engineers), Ltd. Mr. Shaw is managing director of James Kilpatrick & Son, Ltd., electrical installation engineers and contractors of Paisley.

Mr. G. Gadsdon is joining the Hale Electric Co., Ltd., on 20th August as general sales manager and in addition, he will be dealing with the new electronic division recently formed for handling Government contracts. Mr. Gadsdon joined Collaro, Ltd., in 1931, with whom he remained for seventeen years, after which he became associated with Regentone Products, Ltd. **Mr. D. Farrant** remains sales and distribution manager of

Hale Electric and **Mr. S. Kendall** will become export and southern area manager.

Sir Archibald Gill, B.Sc.(Eng.), F.I.R.E., Engineer-in-Chief and Assistant Director General (Engineering) of the General Post Office, is retiring on 1st October, and he will be succeeded by **Mr. W. G. Radley,** B.Sc., Ph.D., M.I.E.E., who is at present Deputy Engineer-in-Chief and Controller of Research, Engineering Department.

Sir Archibald was born at Stoke-under-Ham, Somerset in 1889, and served as an

Sir Archibald Gill

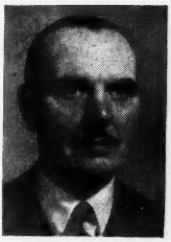
Dr. W. G. Radley

engineering pupil with Yarrow & Co., Ltd., Glasgow. His association with the G.P.O. commenced in 1913, when he entered the Engineering Department as assistant engineer, being attached to the Radio Section. He was appointed executive engineer in charge of the Radio Experimental Section at Dollis Hill in 1925, and became assistant staff engineer in 1929. Three years later he was appointed staff engineer of the Radio Branch, in 1944 he became Deputy Engineer-in-Chief, and in 1947 he was appointed Engineer-in-Chief of the G.P.O. Sir Archibald, who is the retiring president of the Institution of Electrical Engineers, and a past chairman of the Radio Section of the Institution, has served as a member of the Radio Research Board.

Dr. Radley received his education at Leeds Modern School and Faraday House, and his practical training with Bruce Peebles & Co., Ltd. He entered the G.P.O. by open competition as assistant engineer in 1922, and for the whole of his career he has been associated with the Research Branch of the Engineering Department. He carried out early work on interference between power and communication circuits. He is chairman of the Materials Committee of the Radio Research Board, a member of the Radar and Signals Board (Ministry of Supply) and chairman of the Line Communication Committee. He is also a member of various Interdepartmental and E.R.A. Committees. Dr. Radley has frequently represented Great Britain at meetings of the C.C.I.F. (International Advisory Committee on Long-Distance Telephony). He has been elected a vice-president of the Institution of Electrical Engineers for the coming session and is a past chairman of the Measurements Section of the Institution. He is also chairman of the Committee formed to advise the Medical Research Council on hearing aids.

Several new appointments and re-appointments to the **North of Scotland Hydro-Electric Board** have been made by the Secretary of State for Scotland and the Minister of Fuel and Power. Mr. Tom Johnston, the present chairman, and Mr. N. Beaton, whose current terms of office expire in September, have been re-appointed for a further period and Sir Hugh Mackenzie of Inverness, at present a member, has been appointed deputy chairman in place of the late Sir Edward MacColl. Three new members have also been appointed as from 1st September. These are Mr. E. S. Harrison, ex-provost of Elgin, and at one time chairman of the Local Authorities Hydro-Electric Committee; Mr. W. Leonard, formerly Labour M.P. for the St. Rollox Division of Glasgow and a member of the General Council and former president of the Scottish T.U.C.; and Mr. A. I. Mackenzie, C.A., a partner of Brown, Fleming & Murray, chartered accountants, Glasgow. All the members of the Board, including the chairman and deputy chairman, will serve on a part-time basis.

Mr. E. H. Maltby has been appointed general manager of the Sloan Electrical Co., Ltd. He joined the company in 1934 as sales engineer in the London area and, apart from five years in the Royal Armoured Corps during the last war, served in this capacity until his appointment as sales manager in February, 1950.



Mr. E. H. Maltby

Mr. J. Whitfield, superintendent at Stuart Street power station, Manchester, since 1948, has been appointed generation engineer (operation) of No. 3 Sub-Division of the B.E.A. North Western Division. He succeeds **Mr. O. S. Woods,** who has been appointed to the East Midlands Division as chief generation engineer (operation). Mr. Whitfield began his career with the Manchester Corporation Electricity Department in 1929.

The Midlands Electricity Board announces the appointment of **Mr. R. A. York,** B.Sc., A.M.I.E.E., to the position of chief assistant engineer at the Board's headquarters at Halesowen. Previous to this appointment Mr. York was Sub-Area engineer for the South Staffs and North Worcs Sub-Area of the Board. Before vesting date he held various

appointments with the Midland Electric Corporation for Power Distribution, Ltd. Mr. York succeeds **Mr. R. Mallet** who, as announced recently, has been appointed manager of the Worcs and District Sub-Area of the Board.

The B.B.C. announces that **Mr. G. Stannard,** A.M.I.E.E., has been appointed assistant superintendent engineer, lines, in succession to **Mr. W. G. Edwards,** who has retired. Mr. Stannard joined the Operations and Maintenance Department of the B.B.C. in 1932 and was transferred in 1935 to the Lines Department. In 1947 he joined the newly-formed Designs Department, where he has since been engaged on the design of equipment associated with the G.P.O. line networks that link the B.B.C.'s studio centres and transmitting stations.

Mr. R. C. Patrick, Associate I.E.E., has been appointed assistant superintendent engineer, recording, to the B.B.C. Mr. Patrick joined the Research Department of the B.B.C. in 1925 and has since had experience in a number of other departments of the Engineering Division. During the war he was assistant engineer-in-charge at the B.B.C.'s emergency headquarters and later became senior assistant to the superintendent engineer, recording.

In our last week's issue we reported the appointment of **Mr. E. Long,** deputy chief accountant (finance), as secretary of the British Electricity Authority in succession to Mr. H. F. Carpenter, F.C.I.S., F.S.A.A., who will shortly retire. We now reproduce a recent portrait of Mr. Long.

Mr. E. Long

Mr. R. M. I. Hobill, until recently London area manager of Ferranti, Ltd., has now been appointed home sales manager and will operate from Hollinwood. He is being succeeded in London by **Mr. W. D. H. Gregson** who was formerly in charge of sales at the Edinburgh works of Ferranti, Ltd.

The programme for the **E.I.B.A. National Golf Championship** final at the Southport and Ainsdale Golf Club, on 24th and 25th September, includes an 18-hole medal competition for the Visitors' Rose Bowl, presented by the Electrical Wholesalers' Federation. The entrance fee is 10s and forms are obtainable from any area secretary. For an 18-hole medal competition for the Veterans' Trophy, presented by the proprietors of the *Electrician*, the competitors will be those with the best 24 cards in the country submitted by the area secretaries. On the evening of the 24th September there will be a dinner at the Palace Hotel, Birkdale; tickets 17s 6d each are obtainable from area secretaries.

On 25th September there will be the final of the Championship : an 18-hole medal round for the Sir Montague Hughman Trophy. The afternoon events are 18-hole two-ball foursomes for cups presented by Sir Felix Pole.

Mr. W. R. Herod has tendered his resignation as a director of Associated Electrical Industries, Ltd. He feels that as a co-ordinator of the North Atlantic Defence Programme it is inappropriate for him to have business contacts with companies with whom he may be in relation in his official capacity.

Mr. Neville C. Williams, formerly electrical manager with Harland and Wolff at Southampton, has been appointed electrical superintendent of the Overseas Tankship Corporation (U.K.), Ltd., in London. Mr. Williams is succeeded at Southampton by **Mr. Ian Austin,** formerly assistant electrical manager with Harland and Wolff at Belfast.

Mr. H. R. Evans has been appointed managing director of the National Electrical Supplies Co., Ltd., in succession to the late Mr. F. W. Evans.

Miss Kathleen E. Piatt has been awarded the seventh travelling exhibition by the Caroline Haslett Trust, which enables holders to study some aspect of domestic electrification in another country. Miss Piatt, who is housecraft adviser in the Chester Sub-Area of the Merseyside and North Wales Electricity Board, will leave in September for a two-month investigation of electrical housecraft in Switzerland. She is secretary of the Wallasey branch of the Electrical Association for Women and in 1946 was the winner of the Elizabeth Sloan Chesser Cup.

WILLS

Mr. W. J. Burrows, managing director of the Stevenage Electrical Engineering Co., Ltd., and of Electrical Supplies (Stevenage), Ltd., who died on 15th March last, left £8,949 gross (£8,846 net).

Mr. H. F. Reason, for many years an executive director of the Reason Manufacturing Co., Ltd., who died on 4th April last, left £5,373 gross (£4,899 net).

Mr. J. B. Collinge, formerly superintendent of power stations, Salford Corporation Electricity Department, who died on 26th May last, left £2,594 gross (£2,537 net).

Mr. R. A. Struthers, M.C., B.Sc., M.I.Mech.E., assistant chief engineer of the Steam Turbine Engineering Department of Metropolitan-Vickers Electrical Co., Ltd., who died on 12th April, left £7,192 gross (£6,941 net).

North Staffs University College

Lighting Installation in Keele Hall

THE centre of the new North Staffordshire University College is Keele Hall, the former home of the Sneyd family, which dates from the sixteenth century. It is surrounded by acres of beautiful estate. The Hall itself is constructed of grey stone and the interior has features of painted ceilings and original large stone fire-places.

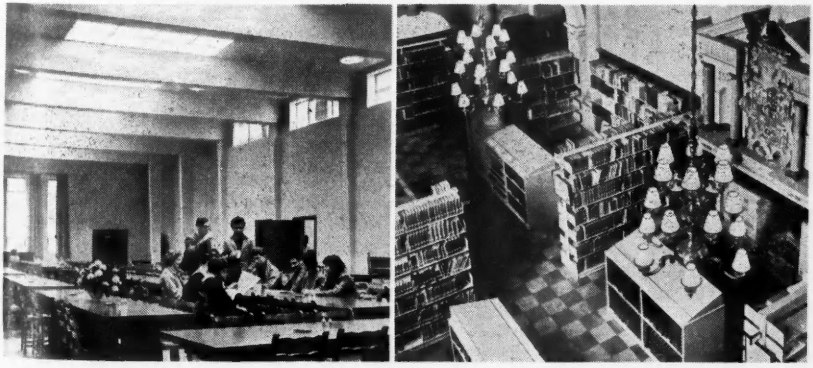
The reconstruction was planned by Mr. J. R. Piggott, F.R.I.B.A., city architect, Stoke-on-Trent; the electrical specification was prepared by the Midlands Electricity Board (North Staffordshire Sub-Area), the wiring being carried out by the Newcastle-under-Lyme District of the Board. The lighting fittings supplied by Falk, Stadelmann & Co., Ltd., were designed in conjunction with the architect to suit the interior and at the same time to give adequate illumination. The outside is illuminated by two real bronze lanterns on piers and a bronze lantern on a bracket overhanging the main entrance.

The library hall, which is approximately 40ft high with a balcony on two sides, is illuminated by two 18-light Georgian fittings; the annexe is lighted by similar fittings but with only five lamps and the balconies and adjoining corridors have similar 3-light fittings.

The library is a particularly beautiful room about 24ft high with a balcony running along three sides and it has a very fine ceiling around which is a 5in flat plaster moulding. In this recess are placed continuous 5ft fluorescent lamps covered by reeded " Perspex " with bronze ends and continuation plates. Two genuine Adam fittings comprising cut glass bowls and gilt metalwork are centrally placed. Under the balcony each individual bookcase is illuminated by special 18in fluorescent lamp fittings, again with reeded " Perspex " and bronze. The average illumination on the bookshelves is 5–6 lumens/sq ft.

The senate room is illuminated indirectly by cold cathode tubing in a plaster cornice with a central laylight illuminated by 5ft hot cathode fluorescent trough type fittings.

The refectory, which is a new construction of reinforced concrete, has a false ceiling in which are fixed specially designed modern louvred fittings each housing a 500 W lamp, the louvres being made of amber " Perspex." The design is



Lighting in Keele Hall: (*Left*) **The refectory;** (*Right*) **The library hall showing the 18-light Georgian fittings**

particularly pleasing; it is unobtrusive and meets the requirements of contemporary design.

The kitchens are lighted by " Saucer " type opal ceiling fittings and porcelain wellglass fittings. In the students' quarters each room has a fabric shade and each set of rooms has the supply controlled by a Falk, Stadelmann house service unit.

A view of the kitchen equipment at Keele Hall

The General Electric Co., Ltd., was the main contractor for the kitchen equipment at the college. The G.E.C. equipment installed comprises four 4·8 kW roasting-ovens; two 18 kW double-pan fish fryers; two 12·4 kW boiling tables; two 8 kW grillers; two 3·7 kW stockpots; two 9 kW steaming ovens; two 12 kW vegetable boilers; two 6·8 kW hotcupboards; and a double-deck pastry oven, 7 kW per deck. There were several sub-contractors for ancillary equipment including Gardner & Gulland, Stotts of Oldham, Dawson Bros. and the Hobart Manufacturing Co.

AUSTRALIAN NEWS

From Our Own Correspondent

THE first power from the Snowy River scheme is expected to be available by 1954. Remarking that the project is as important to Australia as the Tennessee Valley Scheme was to the United States, the American consulting engineer Dr. J. L. Savage, adds that he is very favourably impressed by the engineering organization so far established.

A Norwegian firm's tender has been accepted for the design and construction of the Guthega project in the Snowy River scheme, announces the Prime Minister (Mr. Menzies). It is believed that this contract will be worth between £3 and £4 million, and it is expected that about 450 Norwegian workmen will be brought to Australia to assist with it.

Victorian Development Loan

A new public loan of £6 million for power and fuel development is to be launched by the State Electricity Commission of Victoria at a new high interest rate of 3½ per cent for a term of only ten years. The money is needed to enable the Commission to expedite power and fuel projects vital from a national and defence standpoint. " There can be no half-way measures or temporizing with the problem presented by the present shortage of power and fuel," says the chairman of the Commission, Mr. R. A. Hunt. " The Commission has so accelerated its construction programme that it will require £54 million of new capital in the current financial year."

Tasmanian Project Begun

The main work on the construction of a new hydro-electric project in Tasmania, capable of developing 112,000 h.p., has begun. This will be one-sixth of the Hydro-Electric Commission's output when the current works programme is completed.

Sir Frank Beaurepaire, chairman of Olympic Cables, Ltd., announces that the company's net profit for the year to 30th June, 1951, was £115,535 after providing £37,345 for depreciation, £20,000 for the reduction in the replacement value of stocks of raw materials, and £124,000 for current and deferred taxation. The net profit last year was £84,698.

British Association

Some of the Papers and Discussions

ENGINEERING topics were considered at several of the sectional meetings, of which a preliminary account was given last week, during the annual gathering of the British Association for the Advancement of Science in Edinburgh, which terminated this week.

At the Thursday morning session of Section G—Engineering—two papers on the use of high-ash coal in power stations and the design of large steam boilers for burning fuel of that kind were submitted respectively by Dr. A. A. Taylor (B.E.A.) and Mr. W. G. Marskell (superintendent, Research Department, Babcock & Wilcox, Ltd.).

The first paper reviewed some of the means adopted partly to enable such coal to be consumed successfully and partly for other reasons of boiler availability.

The electricity supply industry was now burning about twenty times as much of the very-high-ash coal as it did in 1939, which was a considerable achievement. How far this trend should continue was an economic question, depending largely on mining methods, the costs of cleaning coal, and the relative costs of using the better and poorer qualities available. Each case presented its own problems, but there were likely to be many cases, especially where load centres were close to coal supplies, where it would be in the national interest to generate electricity from the high-ash coal rather than to clean the coal.

Boiler Plant Design

The second paper surveyed the general problem. Large boiler plant was costly and, in general, must be designed for an economic life of 20 years. It was, therefore, essential to know the conditions it was likely to meet during its life. While boiler plant could be designed to burn any commercial fuel with reasonable efficiency, it could be just as uneconomic to feed coal of low ash content to boiler plant designed for a high ash content coal as it was to fire high ash content coal to a plant designed for one of low ash content. It was rather like trying to run a racing car on kerosene and a tractor on high-octane spirit. With the nationalization of mining and transport, it ought to be easier to get a more comprehensive picture of future coal supplies than was the case when a multiplicity of interests was involved. The problem of the boiler designer and boiler operator should, therefore, be correspondingly eased.

Utilizing Waste Coal

Both these papers were discussed together. Dr. Dryden (British Coal Utilization Research Association) enlarged on one or two points from the chemical point of view. Professor T. R. Cave-Browne-Cave doubted whether it was right to improve a more or less normal type of boiler so that it could deal with coals of higher and higher ash content, or whether it was not better to start at the beginning and design for certain purposes a boiler capable of dealing with really high ash content coals and to use in it all the enormous amount of waste which was available from the washeries and the workings. He felt the latter course would be more satisfactory.

It was once true to say that the most efficient way of using a quantity of coal in the Midlands for power purposes in London was to transport it to the site and burn it there. That applied to fairly low-ash coals, but if 30 per cent of ash had to be transported with the coal to London it was worse than useless, for it was very expensive to get rid of. Therefore he emphasized his plea for the development of a special type of boiler which could be used at the pits.

Dr. Taylor, replying, said that it was no longer more economical to transport coal from the Midlands to London than it was to transmit electricity. In fact the B.E.A. was planning to build a very expensive grid system, so that very large tonnages of coal would be consumed in the Midlands and the electricity produced there would be transmitted to London. Unless large quantities of coal were available very close

to the point at which it could be burned, special boilers would hardly be warranted, again because of the cost of transporting such coals over long distances. There was much to be said for Mr. Marskell's suggestion of mixing coal, so long as a suitable arrangement could be made, if it could be properly mixed and if the mixture were consistent, rather than having to transport a lot of coal from different sources twenty or thirty miles.

Special Firing Equipment

Mr. Marskell added that there were boilers with special firing equipment for burning slurries, the boiler plant itself being not so very special. They worked very efficiently, although conditions in this country were not always suitable. It was necessary to have a great quantity of the low-grade material available at one point, for one could not afford to transport it, and that meant a very big carrying unit, or series of units, within very short distances of one another. That was not common in this country, although it was on the Continent. There must be a continuous supply of coal, the washeries generally must take up the output of the pits, which was not continuous because of shift work, and therefore storage arrangements would have to be provided to cover the periods when the washeries were not working. Further, electricity had to be put into the grid and the B.E.A. had views on that.

One of the papers submitted to Section G—Engineering—was by Mr. T. Lawerie (general manager, North of Scotland Hydro-Electric Board) who first outlined the responsibilities and duties of the Board and then spoke of achievements in its area, which contained three-quarters of the land area of Scotland but only one-quarter of the population.

Electricity was not available to 47 per cent of the population in 1948, representing 170,000 potential consumers, or 600,000 people. The Board did not accept the view that, because they were widely scattered, they were " not worth bothering about." The area produced and exported food, so people who lived there had earned the right to amenities enjoyed by others. There were 41,000 farms in the area, but only one in fourteen was connected to public electricity mains in 1948 compared with one in three in the rest of the country.

During the three years since April, 1948, the Board had connected more than 63,000 new consumers, one-third of the potential number. They represented 220,000 people, three-quarters of them living in country and remote districts; those still to be connected were in more inaccessible parts of the area.

To encourage the employment of building materials native to Scotland, two 132 kV substation control buildings of substantial size, a diesel power station and 13 houses had been completed while 71 houses and a water power station were being constructed entirely of stone; also three large water power stations were being faced with stone, which in several important cases was not more expensive than brick and concrete.

Water power development brought hope to the Highlands and raised industrial prosperity. For instance the manufacture of large water power plant was new to Scotstoun, Clydebank, Kilmarnock, Alloa and Edinburgh where orders had been placed by the Board for 898,290 h.p. of turbines and 369,950 kW of generators; export orders secured by Scotland aggregated 1·4 million h.p. of turbines and 209 MW of generators. The Board's programme had reached the following stages at the beginning of 1951:—

Schemes	Capacity MW	Est. Annual Output Million kWh
In operation	199·7	376
Under construction ..	229·3	465
Construction starting	198·2	736
Promoted	8·1	27·5
Under survey ..	278·5	1,068
Totals ..	913·8	2,672·5

The Sloy plant on Loch Lomond (*Electrical Review*, 10th and 24th March, 1950) of 130 MW in four machines with 910ft head of water was the largest individual station. The neighbouring Shira station on Loch Fyne would contain a similar machine of 40 MW (the largest so far ordered by the Board) designed for a 965ft head, which was high for a Francis turbine.

The 20 MW Kaplan machine on order for the Invergarry station would operate under a 175ft head, which was about the upper limit for this type of turbine, several of which were installed and on order. The 30 MW horizontal alternator in the Lawers station would be driven by two Pelton water wheels, one overhung on each end of the alternator shaft, to operate

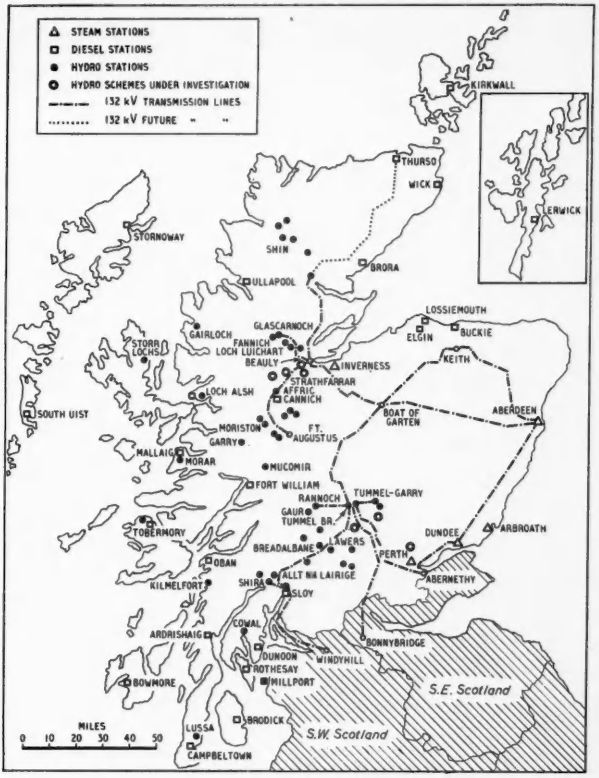
under a gross head of 1,362ft of water. Some of the machines had been designed to withstand run-away speeds of up to 2·8 times the normal operating speed.

An old 6 MW turbo-alternator had recently been removed from the Dundee steam station to make way for a 12·5 MW closed-cycle gas-turbine set. Further replacements would soon be required, for a certain amount of steam plant was valuable to carry base load at times of drought and/or peak load.

The Board was a large user of diesel-driven generating plant in isolated districts. The largest, ten of which were being installed at various places, were Polar engines of 1,540 h.p. built at Govan. The economic burden of operating these stations with fuel oil at its present price was considerable.

The main purpose of the Board's grid lines was not interconnection for mutual support of generating stations, but to transmit hydro-electric power for considerable distances. They also enabled surplus energy from the Highlands to be marketed at a profit which helped scattered inhabitants, whose services would otherwise be uneconomic, to be supplied with electricity at a reasonable price. The surplus power sold to the B.E.A. at peak periods last winter amounted to 156 MW.

Elimination of the need for power cuts was urgent and important, but the continuing growth of consumption was not generally appreciated. Up to seven years were required to complete a modern power station and, last year, nearly as much plant was exported as was commissioned at home. Was that fact in the country's best interest?



Map of power station sites and main transmission line routes in the North of Scotland Board's Area

At one of the sessions Mr. T. A. L. Paton (Sir Alexander Gibb & Partners) presented a paper on modern trends in the civil engineering of hydro-electric schemes. He spoke of the elements of uncertainty relative to run-off from catchment areas. Economic considerations were so closely involved that any method of making a more reliable estimate could not be overlooked.

Rapid survey methods, types of dams, the control of floods and silting, tunnelling and pressure pipe lines were dealt with in turn. The author then dwelt at some length on the design of underground power stations and also indicated some of the changes taking place in methods of building

outdoor power stations, including the employment of labour saving machinery.

In the subsequent discussion Sir Claude Gibb, who presided, made the point that, while the potentialities of hydro-electric schemes in this country were far below those of some others, the fuel situation was such that every drop of water that could possibly be so used must be exploited to the maximum.

Sir Edward V. Appleton (principal and vice-chancellor, Edinburgh University) speaking as " a mere physicist " said there were two sources of energy through water: that which came, he imagined, from rainfall and that which came from tidal action. If they continued to use the tides they would slow up the rotation of the earth.

Mr. R. W. Weekes pointed to the fact, as shown in the paper, that the River Thames' run-off in successive 30-year cycles varied as much as from minus 10 to plus 15 per cent from the long-term mean. He asked whether that was due to the change in catchment areas by the building of towns, increasing the rate of run-off by the impermeability of the soil, or whether it was a factual change of rainfall in the particular catchment area.

Mr. Paton did not think that was the cause in the case of the Thames, but he agreed that changes due to the building up or the development of land had to be borne in mind. Replying to a question whether it was necessary, by civil engineering means, to increase catchment areas, or to reduce them, so that they could the better be controlled by dams, he said that everything possible was done to increase them by artificial means, particularly in Scotland where the volume of water in each valley was fairly small. Two or three valleys would be connected together by tunnels or aqueducts to increase a catchment area and to bring all the water available into one common reservoir, giving as much water as possible to control the feed to the turbines. For hydro-electric generation that was perhaps even more necessary than for water supply schemes.

Underground Power Stations

Mr. A. Feiner, referring to underground power stations, one of the advantages of which was said to be that they reduced friction losses, asked if there were not a difficulty almost equivalent to that reduction of friction loss if there were a long discharge tailrace. Although there might not be a surge chamber on the upstream side, one might have to be provided on the downstream side.

Saving in Cost

Mr. Paton agreed, but said that, even so, there was the saving in the cost of the penstock. The pressure pipeline was very simple; a hole could be tunnelled through rock and lined with concrete, relying on the strength and depth of the rock to resist all the forces of uplift and pressure, making a simple arrangement with pipes running straight through to each machine. But there were snags. The power station had to be kept dry, one would probably have to treat the inside walls if condensation trickled down them; the worst trouble was probably to design the plant and to provide access in order to be able to replace or repair machines. However, those problems could be solved and it had been proved in a number of schemes that the saving in cost was something like 30 per cent. In countries where that had been adopted considerably the problem of protection from avalanches and from ice was a very real one.

Mr. Capper said that the view was sometimes expressed that hydro-electric schemes were blots on the landscape but the dams and power stations illustrated by Mr. Paton were, in fact, very pleasing in their appearance. But he had visited the old Grampian power scheme some years before the war and had seen a very fine looking power station whose appearance was utterly spoiled by a mass of transformers and other electrical gear in the open alongside.

Mr. D. H. McPherson (joint secretary of Section G and a member of the Society for the Preservation of Rural Scotland) also agreed that the hydro-electric power stations looked very fine, as did the dams, when the reservoirs were full. But he had seen pictures of them when they were half empty, showing a vast expanse of ground with no vegetation which was a blot on the landscape. There was a chance for the engineer and possibly the botanist to overcome that particular feature.

Professor W. Fisher Cassie (recorder, Section G) mentioned that there was considerable opposition to the Pitlochry scheme at the beginning, but when he had visited the area last year he had found the people there were very proud of it.

Dr. Cameron Smail, who wondered if there were experience of the deterioration of dams by scour, said he had visited a power station in Canada where the whole of the back of a large dam had to be re-surfaced as the result of deterioration. A great deal depended on workmanship and so forth, but the technique of concrete construction had been greatly advanced. Subsidiary dams to regulate the water in the tributaries would be valuable, particularly where there was some conflict between adjoining States concerning the availability of the water.

The chairman recalled that erosion trouble was experienced at the Assuan dam in the early days, due to the discharge from the large sluices. The granite on which the structure was founded had proved not so sound as was expected and enormous pieces were dislodged. A million pounds or more had to be spent on the provision of an apron on the downstream side of the dam.

Water turbines for hydro-electric projects were the subject of a paper by Messrs. R. W. Weekes and A. Feiner (Harland Engineering Co., Ltd.) who dealt with the basic factors which determined the types of machines to be adopted for particular installations, together with means for controlling ancillary plant. The layout of water power plant from the standpoint of turbine design received particular attention. The control from one centre of a group of remote unattended stations could often, by saving labour costs, enable an otherwise uneconomic scheme to be justified.

In the discussion Mr. T. A. L. Paton asked if the authors had figures of the costs of hydro-electric as compared with thermal generation schemes.

Capital Costs

Mr. Feiner referred to some figures—which he believed had been published in one of Mr. Paton's papers—showing that the capital cost of a hydro-electric scheme was something like £85/£100 kW as compared with £75 kW for a thermal power station. Those were purely capital costs and did not take account of amortization, which extended over a very much longer period for a hydro-electric station, which he believed would last much longer than a thermal station. The major difference between water and steam turbine governors was the size of the servo set. Basically the problem was the same, except that water turbines had to deal with greater forces.

Mr. Weekes, replying to a suggestion that not too much emphasis should be laid on the capital costs of hydro-electric schemes because it was a duty to use one natural resource when another was in difficulties, even if it involved a slight increase of cost, said that the cost of the machinery in a hydro-electric scheme was a very small part of the total capital cost of the scheme. When one included the cement, steel, etc., used on the civil engineering side and drew a true balance between thermal and hydro-electric generation costs, while everything appeared to favour the hydro-electric, the actual costs of civil engineering work had gone up so vastly in recent years that the advantage was not brought out on the £ s d basis to the extent that one anticipated. Against that hydro-electric generation did not use diminishing supplies of coal and, therefore, the expenditure on labour on a hydro-electric scheme was a very fine investment for the future.

Cavitation Problems

Dr. A. P. Thurston asked whether cavitation troubles had been overcome entirely. Mr. Feiner replied that certainly experience over the last 40 or 50 years had helped towards the solution of the problem. By no means had cavitation problems been overcome, and every case must be considered from the cavitation standpoint, particularly with hig speed machinery.

Dr. A. Alan Taylor asked what were the runaway speeds of the various turbines and whether there was a possibility of reducing them in order to ease the problems of the generator designer. Referring to a power station in the United States having 10 Kaplan turbines, he asked whether it would not have been more economic to have used about 8 turbines having fixed blades.

Mr. Feiner said the runaway speeds were, roughly, in an impulse turbine about 80 per cent above normal speed, in the low-speed Francis turbine it was about 60 per cent, in the high-speed Francis turbine about 125–130 per cent, and in the Kaplan turbine something like 200 per cent. But the machinery was quite capable of dealing with the trouble as it occurred.

Mr. Weekes dealt with the question of the Kaplan turbines in the U.S.A., and said it was a matter of economics. There were fluctuations of the rate of flow available daily and throughout the year, and there could be no doubt that by using Kaplans

the best available output could be obtained from a group of machines. The reason for using all Kaplans instead of some Kaplans and some turbines with fixed blades was that the machinery cost was so small in relation to the civil engineering costs that the operators preferred to have 100 per cent flexibility rather than to instal a number of units which they had to run at a fixed head as well as a fixed output.

Mr. T. A. L. Paton emphasized the point that in this country hydro-electric schemes must justify themselves by being able to sell electricity to the B.E.A. at the same price as, or at a lower price than, that at which it was supplied by thermal stations. That was in fact done in Scotland and he thought that it was a good recommendation for the adoption of hydro-electric schemes.

Ceylon Electrical Imports

IMPORTS of electrical goods into Ceylon last year showed a healthy increase in the aggregate, a decline in some items in the machinery group being more than offset by an advance of about 30 per cent in the lighter apparatus.

	1950 Rs. (000)	Inc. or dec. on 1949 Rs. (000)
Control and switchgear	1,589*	− 1,609
Transformers and convertors	249*	+ 90
Generators and alternators and exciters	548	− 158
From United Kingdom	486	+ 135
„ *United States*	62	− 293
Motors	598	+ 57
From United Kingdom	540	+ 31
„ *United States*	40	+ 18
Electrical machinery not elsewhere specified	1,264	+ 269
From United Kingdom	1,018	+ 187
„ *United States*	36	− 32
Rubber insulated wires and cables	997*	+ 71
Other electric wires and cables	2,007*	+ 705
Lamp bulbs, gas filled	408	− 32
From United Kingdom	379	− 48
„ *Holland*	18	+ 12
„ *Japan*	12	+ 9
Other lamp bulbs	188	+ 36
From United Kingdom	151	+ 13
„ *Japan*	20	+ 9
Torch bulbs	509	+ 230
From United Kingdom	206	+ 91
„ *Hong Kong*	149	+ 60
„ *United States*	24	− 37
Radio instruments and apparatus	1,633	+ 166
From United Kingdom	1,600	+ 359
„ *United States*	101	+ 40
„ *Holland*	406	+ 276
Other telegraph and telephone instrument	1,187*	− 3
Lighting accessories, fittings and switches	2,563	− 32
From United Kingdom	1,102	− 303
„ *United States*	38	− 68
„ *Hong Kong*	1,315	+ 433
„ *Japan*	41	− 13
Batteries, dry, radio	25*	+ 3
Ditto, other than radio	3,366	+ 1,068
From United Kingdom	264	+ 148
„ *Malaya*	2,426	+ 564
„ *Austria*	454	+ 454
Other batteries and accumulators	137*	+ 87
Electrical goods and apparatus not elsewhere specified	2,734	+ 1,282
From United Kingdom	2,048	+ 806
„ *United States*	206	+ 117
„ *Japan*	2	− 8
„ *Germany*	443	+ 442

* Mainly from United Kingdom

The accompanying table gives the values in 1950, with the chief supplying countries, and notes of increases or decreases compared with 1949. It will be seen that the share of the United Kingdom was well maintained, though Japan and Germany have got back in some lines. Australia made a noteworthy contribution to the battery trade.

According to a recent report of the Central Bank of Ceylon the country's financial and economic situation is inherently strong, in spite of inflation. Work has been started on two major schemes under the Colombo Plan, namely the Laksapana hydro-electric project and the Gal-Oya multi-purpose development. The first stage of the former, with an initial capacity of 25,000 kW (later to rise to 75,000 kW) was completed during 1950. A project similar to that at Gal-Oya is planned on the Walawe Ganga river where 10,000 kW of power will be generated. (Rupee = 1s 6d approx.)

Television Training

THE General Electric Co., Ltd., is providing for its radio dealers in Scotland, two television training centres, in anticipation of the extension of the TV service. The first centre is now operating at Magnet House, 71, Waterloo Street, Glasgow, and will remain open until the end of September. The other will open at Magnet House, 8, George Street, Edinburgh, on 1st October, for five weeks. Each course lasts a week and includes a certain amount of theoretical instruction and a substantial amount of practice in the localizing and rectifying of faults on receivers.

Commerce and Industry

A.S.E.E. and Cost of Living

Iron and Steel Prices Increased

THE recent annual conference of the Association of Supervising Electrical Engineers passed the following resolution unanimously:—

"That this Conference views with great concern the continual delay in closing the ever-widening gap between the increasing cost of living and the remuneration of supervising engineers, and calls upon employers to give immediate consideration to the need for the salaries of such engineers to be raised to a level which will maintain a reasonable enhancement over the earnings of the manual workers. Further, this Conference urges the importance of this request."

The delegates were emphatic in their view that the cost-of-living figures published by the Ministry of Labour did not reflect the rising prices which the higher grade employees had to meet and that these employees were considerably worse off financially than they were five years ago.

Uganda's Modern Hotel

The recently built Lake Victoria Hotel at Entebbe in Uganda is all electric. It has bedroom accommodation for over 100 visitors, a dining room to seat 250 persons, lounges, bars, writing and reading rooms, billiards room, ladies' and gentlemen's hairdressing saloons and an all-electric laundry.

The electrical equipment, practically all of which has been provided by the G.E.C., includes the complete lighting installation, water heating and electric cooking apparatus, ventilating equipment, a luminous call system and 59 synchronous electric clocks. Power is fed through three 4-bar busbar chambers at 415 V, separate panels being provided for lighting services, water heating and sundry power services, and the cooking equipment. The total loading is 380 kW.

Lighting within the hotel is all tungsten and twenty-seven different designs are employed for the 549 lighting fittings. The kitchen equipment consists of two 30 kW double oven ranges; a 3-pan 27 kW fish fryer; a bain marie; two vegetable boilers; a griller-toaster, hotcupboard, pastry oven, stock pot, refrigerator, a hot and cold servery, and a café set provided by Stotts of Oldham, Ltd. Hot water is provided throughout the hotel by various types of electric water heaters ranging from 20 gallons to 100 gallons capacity. The total capacity of the water heaters is over 1,000 gallons. Ventilation equipment includes a number of extract fans and floor-mounted circulator fans. A luminous call system with seventy-seven push positions and incorporating four local indicators and one master indicator is also installed.

Dining Room of the Lake Victoria Hotel, Entebbe, Uganda

Wired Television Agreement

Broadcast Relay Service, Ltd., and Electric & Musical Industries, Ltd., have agreed a long term basis of co-operation in the field of wired television. The two groups will pool their wired television research and techniques, and the arrangement envisages the participation of radio retailers.

S.E.E.B. Purchasing Arrangements

The functions of the headquarters Purchasing Department of the South Eastern Electricity Board will in future be exercised broadly as follows by the chief officers of the Board:—*Engineer-in-Chief:* Engineering supplies for use on the Board's side of the consumers' terminals; sale of scrap. Through the surveyor: Supplies for building construction, repairs and maintenance. Through the transport and stores

officer: Vehicles and other supplies for repairs and maintenance. *Chief Commercial Officer:* All consumers' apparatus and equipment (industrial, commercial, domestic, farming, and public lighting) on the consumers' side of the consumers' terminals. *Secretary:* Printing and stationery, publications, office furniture and office machinery.

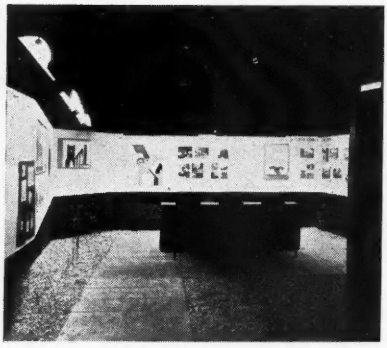
Aluminium Directory

The 1951 edition of the Aluminium Development Association Directory of Members gives the names of the members of the Council, a brief statement of the constitution and objects of the Association and the names, addresses and other particulars of its member companies including, where applicable, associate or subsidiary companies. In each case a short description is given of the activities and products of the company. By means of an index of products classified under aluminium and aluminium alloys readers are referred to all member companies producing any particular product.

Lighting at Architectural Exhibition

An interesting Exhibition of Architecture is being held this year in Belfast arranged for the Festival of Britain by the Royal Society of Ulster Architects in association with the Council for Encouragement of Music and the Arts. The Exhibition has been set out in the ruins of Coates's Buildings in Castle Street, one of Belfast's bomb-damaged sites. This contribution of Northern Ireland architects to the Festival synchronizes with the golden jubilee of the foundation of the R.S.U.A. It is a stimulating display, imaginatively presented in a very unconventional setting. An important feature is the lighting of the models and photographs which largely build up the exhibition. The various lighting schemes were designed by the R.S.U.A. and installed by Adair Brothers.

Siemens " Sieray " fluorescent lighting at the Belfast Exhibition of Architecture



Siemens filament lamps and " Sieray " fluorescent lamps, lighting fittings and equipment were supplied by Siemens Electric Lamps & Supplies, Ltd.

The Engineer as a Public Speaker

The great advantage to the engineer of being able to speak confidently and clearly in public is stressed by Mr. B. Adkins in *B.T.H. Activities.* In the B.T.H. advanced engineering course, of which Mr. Adkins is senior lecturer, a special attempt is made to help students to develop this ability to speak in public. Each week a member of the class spends half an hour before the blackboard giving a short lecture based on the homework of the previous week. This has proved of considerable value in improving style and general effectiveness.

The importance of audibility, understandability and legibility on the blackboard is emphasized, as well as the need for care in the preparation of a lecture. Mr. Adkins says that the timing, the balance of the parts, and the sound of the phrases can be checked by lecturing to a mirror. A lecturer must not read his lecture, or at least he must deliver it as though he is not reading it. A lecture can be spoilt by distracting mannerisms. A great mistake, though a very common one, is to attempt to cover too much ground. The art of a lecture is to discard all details that are not essential to the main theme.

British Television for South America

An important contract for the supply of television equipment has been awarded to two British firms by the Municipality of Bogota, Colombia. The Marconi Co. will be supplying the transmitter and the complete studio centre similar to those being supplied to the United Nations Organization in New York, and Montreal, Toronto, Madrid and Barcelona. The equipment will be manufactured to the American standard of 525 lines. E. K. Cole, Ltd., will supply the television receivers. An interesting feature of this announcement is that television in Bogota will be a municipal effort. The Municipality, in co-operation with the Municipal Bank of Bogota, will supply all the programmes and will provide television receivers under a hire purchase scheme.

Domestic Refrigerator Handbook

A useful pocket-sized 150-page book, the " Electric Domestic Refrigerator Handbook," published by the British Electrical Development Association, 2, Savoy Hill, London, W.C.2 (price 5s for a single copy, £2 14s for a dozen or £21 5s for 100 copies) is an excellently produced guide to the practical installation and maintenance of domestic refrigerators, explaining the fundamental theory of refrigeration in a concise and easily understandable manner. It deals with the question of maintenance on general

lines, however, as it is primarily intended as a supplement to, and not a substitute for, the various manufacturers' maintenance handbooks. The main emphasis is on pre-war models, the maintenance of which has become a problem. However, a selection of typical post-war models is described in detail.

Increased Steel Prices

The Minister of Supply (Mr. G. R. Strauss) has made an Order increasing controlled maximum prices of iron and steel products from 13th August. The increases are necessary because of a sharp rise in the prices of imports of iron ore, scrap, pig iron and semi-manufactured steel and recent increases in wages, transport, scrap and fuel costs.

The loss arising from buying finished steel abroad and selling it in this country at home prices has hitherto been borne by the Exchequer. This loss has risen steeply with the sharp rise in world prices and the Government has decided that to avoid an increase in the subsidy, the trading loss, but not the import duty, should now be recovered by an adjustment spread over home controlled prices. This accounts for over 20 per cent and other imported steel and steel making materials for approximately 40 per cent of the overall price increases.

The following are examples of the increases:—

	Old basis price Per ton £ s. d.	New basis price Per ton £ s. d.	Increase Per ton £ s. d.
Foundry pig iron	10 13 0	11 4 6	11 6
Basic pig iron	10 19 0	11 15 6	16 6
Soft basic billets	17 9 0	21 16 6	4 7 6
Re-rolled bars	22 15 0	27 11 0	4 16 0
Sheets uncoated	29 13 0	35 15 6	6 2 6
Tinplate (per basic box)	2 2 7½	2 9 6½	6 11

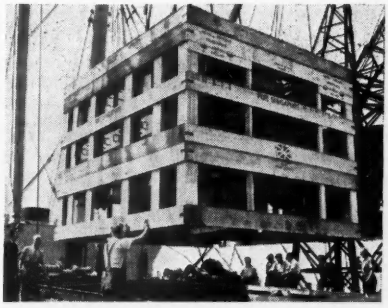
United Kingdom prices will in the main continue to be lower than corresponding domestic prices in other countries. The Order—the Iron and Steel Prices (No. 2) Order, 1951, S.I. No. 1423—is obtainable from H.M. Stationery Office (price 4d).

Dearer Nut and Bolts

The Minister of Supply has also made an Order which increases the controlled maximum prices of bolts, nuts, etc., from 13th August. The increased prices reflect the increase announced in the price of steel, and increases in the costs of the bolt and nut industry. The Bolts, Nuts, etc., Prices (No. 2) Order, 1951 (S.I. No. 1422) can be obtained from H.M. Stationery Office.

Large Transformer for Singapore

To reduce the time required for erection on site the British Electric Transformer Co., Ltd., recently shipped to Singapore a 12,500 kVA transformer complete with two sets of type B.S. on-load tap-changing equipment, a total net weight of 34 tons. The transformer, a 22[illegible]6 kV interconnector unit, has in-phase



A B.E.T. transformer being loaded on board ship for Singapore

tappings for plus or minus 12½ per cent in twenty 1¼ per cent steps and quadrature boosting tappings for plus or minus 6 per cent in twelve one per cent steps. Both on-load tap-changers are arranged for remote electrical control by push-buttons. Cooling is ON/OFB; the " A " type cooler was shipped separately.

Welding Research

Members of the staff of the British Welding Research Association welcomed sixty visitors from the International Institute of Welding Conference to the Research Station, Abington Hall, near Cambridge, on 17th July. Parties of the visitors were taken on a comprehensive tour of the establishment, and various research groups exhibited recent work. A demonstration was given of the argon shielded self-adjusting metal arc for welding aluminium.

Austin Exhibition at Vancouver

During the past fortnight the Austin Motor Co. (Canada), Ltd., has been staging a special exhibition of Austin cars and trucks in the Seaforth Hall, Vancouver. By arrangement with the Austin Co. (Canada) and with the collaboration of their distributors for British Columbia, Vancouver Machinery Depot, Ltd., and the latter's associated company, the Vancouver Engineering Works, Ltd., I.T.D., Ltd. (in association with Austin Crompton Parkinson Electric Vehicles, Ltd.) are showing a representative range of their fork-lift and industrial platform trucks manufactured in Britain.

Waste in Distribution

A conference on avoiding waste in distribution has been convened by the Incorporated Sales Managers' Association for 26th October next at the Connaught Rooms, London, W.C.2. There will be three sessions and a formal luncheon. The subjects to be dealt with at the three sessions are " Assessing the Market and Selecting the Target," " Training and Briefing the Sales

Force," and "Securing the Co-operation of Distributors." The fee for the conference and luncheon will be £1 15s.

The Conference will be preceded by a dinner-dance to be held on 25th October at the May Fair Hotel. Tickets will be £1 15s each. Applications for registration for the conference and for dinner-dance tickets should be made to the Secretary of the Association, 4, Holborn Place, London, W.C.1.

P.O. Engineers' Increase

Increases in pay for nearly 60,000 members of the Engineering, Supplies and Motor Transport Grades of the Post Office Engineering Department have been notified to the Post Office Engineering Union by the Civil Service Arbitration Tribunal. The award follows a claim by the Union heard on 23rd July. An official of the Union stated that, broadly speaking, the award represented an average increase of 10s a week, compared with an average of 5s a week that had been offered by the Post Office and an average of about 25s claimed by the Union. He described the award as extremely disappointing. A meeting of the National Executive Committee to consider it was to be held on Wednesday this week.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £234 0s 0d
Fire Refined 99·7 per cent ..	ton £233 0s 0d
Fire Refined 99·2 per cent ..	ton £232 10s 0d
COPPER Tubes	lb 2s 2½d
Sheet	ton £284 10s 0d
H.C. wire and strip	ton £261 15s 0d
LEAD, English	ton £181 10s 0d
Foreign	ton £180 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £822 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1½d
Sheet	lb 2s 4½d
Wire	lb 2s 7½d
PHOSPHOR BRONZE	
Wire	lb 3s 6½d
RUBBER, No. 1 R.S.S. spot ..	lb 45½d–45½d

Gas-Turbine Bibliography

A 64-page bibliography of books (1910–1950) and of other published information (1940–50) covering gas turbines, jet propulsion and rocket power plant has been compiled as NBS circular 509 by the U.S. National Bureau of Standards. It is so classified that articles of specific interest may be selected with ease and, for convenience, the references are grouped according to subject matter. Subdivisions are arranged chronologically and, within that order, alphabetically by authors. An introduction discusses the classification and rating of jet engines. The bibliography is obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, 25, D.C., U.S.A., price 25 cents.

Metals Economy Committee

Mr. Strauss, Minister of Supply, in conjunction with Mr. Stokes, as Minister of Materials, has appointed an advisory committee on metals economy to help him ensure economical use in engineering and the defence programme. Mr. D. A. Oliver, director of research to the B.S.A. group of companies, is chairman. Members of the committee are drawn from industry and government departments. The industrial members are: Dr. G. L. Bailey, British Non-Ferrous Metals Research Association; Mr. H. A. R. Binney, British Standards Institution; Mr. H. H. Burton, English Steel Corporation, Ltd.; Mr. W. C. F. Hessenberg, British Iron and Steel Research Association; Mr. E. Grinham, Standard Motor Co.; Dr. I. Jenkins, General Electric Co., Ltd.; Dr. L. B. Pfeil, Mond Nickel Co.; and Mr. C. J. Smithells, British Aluminium Co.

Catalogues and Lists

Plastic & Metal Products, Ltd., 162, Grays Inn Road, London, W.C.1.—Priced leaflet on industrial reflectors.

Electropower Gears, Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9.—Four technical folders on geared motors and gear boxes.

Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11.—Brochure on the mounting and maintenance of "Morganite" brushes.

Watson & Sons (Electro-Medical), Ltd., East Lane, North Wembley, Middlesex.—Technical brochure describing the type XT-1 apparatus for deep X-ray therapy.

High Duty Alloys, Ltd., Slough, Bucks.—Comprehensive and fully illustrated 43-page technical brochure partly in colour on extrusions in "Hidumidium."

Ransomes Sims & Jeffries, Ltd., Orwell Works, Ipswich. — Illustrated folder on electric trucks, tractors and fork lifts.

Metway Electrical Industries, Ltd., King Street, Brighton, Sussex.—Priced catalogue of terminal blocks and strips, rubber grommets and bushes, moulded bushes and china connectors.

Elkay Electrical Manufacturing Co., Ltd., 42, Woburn Place, London, W.C.1.—Priced and illustrated leaflet on bulkhead fittings, inspection lamps, marine plugs and sockets, e.s. porcelain lampholders and porcelain connectors.

Diesel Equipment, Ltd., Cowley Mill Road, Uxbridge, Middlesex.—Catalogue of diesel generating equipment.

ELECTRICITY SUPPLY

North-East Tramway Conversion

New Zealand Geo-thermal Project

BUSES have now completely replaced the trams operated by the Gateshead & District Tramways Co., Ltd., at Gateshead, Felling and Newcastle, and the company has been renamed the Gateshead & District Omnibus Co., Ltd. Speaking at a dinner at Newcastle to mark the conversion, Mr. W. T. James, chairman of the company, recalled that the trams began operating in 1901 when the company became associated with the British Electric Traction Co., Ltd. In 1923, the Gateshead trams were linked with those of Newcastle City Council by tramlines laid over the High Level Bridge. Lines were also laid on the Tyne Bridge opened in 1928. The conversion of trams to buses in Gateshead started in March last year and has been completed in less than 18 months. At one time it was proposed to use trolley-buses, but it was later decided that motor-buses were more suitable. Sunderland is now the only North-East town where trams are still used.

House Installations

The Ministry of Local Government and Planning has approved Wallsend Town Council's plans to instal electricity in 374 houses at a cost of £2,895.

Morpeth Town Council proposes to instal electricity in 415 houses, three shops and flats at a cost of about £11,000.

Houses Without Electricity

It was reported to the St. Faiths and Aylsham (Norfolk) R.D.C. recently that electricity would not be available for two or three months at the Sprowston site where a number of new houses are ready for occupation. This, the Housing Committee pointed out, also meant that there would be no supply to operate the sewage works. The Eastern Electricity Board stated that the delay was caused by pressure of work and the present severe restrictions on capital expenditure. Besides urging the Board to provide the supply, or a temporary one, without delay, the Council decided to seek the help of the Ministry of Local Government and Planning and the local M.P.

Electricity was also involved in another problem before the Council. According to the Housing Committee, it had not been possible to obtain electric wash boilers for installation in new houses and permission had accordingly been given for portable solid-fuel wash boilers to be erected in the back gardens pending the delivery of electric boilers. A member of the Council, Mrs. L. M. Johnson, said that they had endeavoured to give the tenants in rural districts the same amenities as the city housewife had, but now they had to go back to primitive methods; the whole thing was "most disappointing and frustrating."

Barking-Ilford Underground Cable

Considerable progress has been made with the British Electricity Authority's 132 kV underground cable installation between Barking and Ilford. This circuit is the largest of its kind yet undertaken in this country. The contract was awarded to British Insulated Callender's Cables, Ltd., and called for the supply and installation of 9,000 route yards of two 3-core 0·6 sq in 132 kV impregnated pressure cables, associated auxiliary cables and a quantity of 3-core 0·06 sq in 33 kV solid-type cable.

When completed, these underground transmission cables will be a major reinforcement to the existing network in the Ilford, Chigwell, Woodford and Buckhurst Hill districts, which comprise the north-east corner of the L.E.B. area and have been extensively developed during recent years as residential and light industrial areas. The existing supply of electricity, apart from about 3,000 kW generated at Ilford, comes from the Barking power station by 33 kV feeders, some of which are now being operated at 22 kV. The new 132 kV circuits will be connected at the Barking end of the installation to the switch-house now being built in conjunction with the power station extensions at Barking "C" and, at the Ilford end, will be connected to a new substation where the voltage will be stepped down to 33kV and distributed to the surrounding districts.

Ulster Planning Appeal

A condition which the Omagh Urban Council sought to impose in connection with a proposal by the Electricity Board for Northern Ireland to carry out certain development was the subject of a planning appeal at Stormont recently. The Council sought to ensure that the cost of any future removal of the lines and equipment

should fall upon the Board, even though the work was carried out at the request of the Council to enable it to undertake building programmes and the like. Mr. F. A. L. Harrison, K.C., for the Board, said that it would be intolerable if the Board's future development was subjected to such a condition. If upheld it would enable the Council at some future date to say "Take away your lines and pay the cost." Mr. J. C. MacDermott, on behalf of the Council, said it was merely a wise precaution on the part of the local authority. It was protecting itself and the ratepayers against something which might occur well in the future—one did not carry out planning schemes overnight.

Geo-thermal Investigations

When members of the Auckland (N.Z.) Electric Power Board inspected borings near Wairakei they were told that plenty of electric power could be obtained from the geo-thermal project now if required, though output would be on a low-efficiency basis. The amount of steam produced by the test bores is greater than expected. At present the bores have reached a depth of 600–700ft. The chief difficulty is the quantity of water in the steam, but it is thought that as the bores go deeper the steam will become drier. A second 8in bore has been opened and others up to 20in diameter may be sunk, according to the *New Zealand Electrical Journal*, before a decision is made whether the site is suitable for electric power generation.

Objections to Smethwick-Drakelow Line

It is reported in the *Birmingham Gazette* that Aldridge Urban District Council has asked the Minister of Fuel and Power to hear its objections to the construction of an overhead power line across Barr Beacon ridge, a local beauty spot. Barr Beacon Joint Committee and Merrion's Wood Trust are also making objections. The line, from Smethwick to Drakelow, would cross the ridge near the 700ft beacon and the Council is asking for the route to be altered or the cable to be put underground.

Delay at Wisbech

A local paper reports that private householders at Wisbech (Cambs) have been told that they cannot have a supply of electricity at present. It has been stated by a representative of the Eastern Electricity Board that the delay is only temporary but at present the Board is not connecting houses other than Council houses or dwellings in which fittings have already been installed. Exceptions are made in cases of illness or emergency or if only a small amount of work is involved.

Power Situation in South Africa

Expanding Requirements of Mining Industry

A CONSIDERABLE problem in South Africa at the present time, as elsewhere, is that of power shortage. The Electricity Supply Commission (chairman, Mr. A. M. Jacobs), in its report for the past year, traces the causes and notes that the universal shortage has a cumulative effect, in that power cuts in Great Britain, for example, delay the manufacture of plant for South Africa.

The Commission's search for much-needed generating plant has not been confined to any particular country or continent and an agreement for a $30 million loan signed in Washington last January makes no stipulation that the proceeds must be used for purchases from the United States. This is the Commission's first external loan and is to be used only for the purchase of imported materials, mainly from the United Kingdom.

By a stroke of good fortune the Commission was able to place an order early this year with a British manufacturer for a 30,000 kW set for comparatively early delivery. The company, having a gap in its programme, put the plant in hand in anticipation of an order; it was offered to the Commission and accepted when it was found that two suitable boilers could be obtained from the United States to match the delivery date. This plant will be installed in the Rosherville power station and is expected to be in operation by 1953.

The Commission has in hand a large construction programme which will add 973,730 kW to the installed capacity of 1,513,975 kW at the end of December, 1950. Last year the net gain was small—28,000 kW—but since then a new 33,000 kW set (No. 6) has been brought into operation at the Vaal station and a 40,000 kW set at Congella.

The bulk of the new plant, amounting to some 785,000 kW, is destined for the Rand undertaking where the load situation is most critical. Devaluation of the South African pound in 1949 was followed by a sharp increase in the demand for power for the gold mines of the Witwatersrand, while the developing mines of the Orange Free State are making further calls upon the Commission's resources. Consumption of the latter, in fact, rose from 54 million kWh in 1949 to 117 million kWh last year. Though " Escom " is notified of the anticipated future requirements of the mines, the estimates sometimes prove unrealistic. In 1948, for instance, it was forecast that the O.F.S. mines would need 133,000 kW by the end of 1955, whereas a new estimate of the load is 240,200 kW.

So far the shortage has been met by the gold mines voluntarily submitting to restriction of consumption which, by careful planning, has been borne without production being affected. Towards the end of last year it became clear that definite limitations must be imposed upon the Rand consumers in general, following appeals for peak load reduction. The policy now is that until sufficient plant is available applications for new connections cannot be accepted unless they are for essential services or in the national interest.

Besides the actual building of the power stations the Commission has difficulty in finding the necessary trained personnel for staffing them, and overseas recruitment is stated to be under consideration.

Transmission Extensions

Work carried out last year included numerous schemes for transmission extensions, increasing the aggregate route mileage of lines and cables by 528 to 6,636. At present under construction are 132 kV lines from Colenso to Umgeni (114 miles) and Umgeni to Springfield (8 miles, double circuit), while lines to operate at a similar voltage are projected between Vaal and Vierfontein (80 miles), Vierfontein to Alma (60 miles, double circuit), Alma to Virginia Terminal (15 miles) and Taaibos to Libanon (60 miles). In addition 318 miles of lines of 40 to 88 kV are being constructed and a considerable further route mileage is projected.

In 1950 the Commission generated 7,773·6 million kWh (against 7,075·3 million in 1949). The highest overall thermal efficiency was again achieved by the Vaal station with 22·48 per cent (s.o.); total output 1,231·4 million kWh. Congella Nos. 1 and 2 followed with 20·67 per cent, output 542·1 million kWh, and Klip took third place with 19·81 per cent. output 2,567·9 million kWh.

Sales amounted to 6,910·6 million kWh (6,222·2 million in 1949), 1,109·2 million kWh being disposed of in bulk to municipalities. Of direct supplies, mining consumers took 4,162·8 million kWh (3,828·5 million).

The aggregate revenue of the Commission rose from £8,317,263 in 1949 to £9,526,071 last year and after meeting all costs there was a deficit of £53,897 against a loss of £21,401 in 1949. Revenue per kWh sold averaged 0·3308d (0·3208d). Capital expenditure in 1950 amounted to £7,447,219 making the total £57,564,260; this will be raised to approximately £122,200,000 on completion of the works to which the Commission is committed.

Aircraft Distance Measuring

TOWARDS the end of 1950, B.O.A.C. decided that 1,000 Mc/s distance measuring equipment (D.M.E.), designed and developed at the Edinburgh works of Ferranti, Ltd., should be used by the De Havilland Comet on its scheduled service to the Middle East. This service is due to start in the autumn of this year, and will be the first using jet aircraft.

Distance measuring equipment is a short range radar navigational aid which presents the pilot of an aircraft with continuous information as to his exact distance from a ground beacon installed at an airfield or similar location. It also gives him an indication as to whether the beacon is to port or starboard of the aircraft. which permits " homing " to the beacon to be carried out. This aid is one which was proposed for international use shortly after the war and in June of this year the specification was approved by the COM: Division of the International Civil Aviation Organization.

The first overseas installation of the ground component of D.M.E. is taking place at the beginning of this month, when a beacon is being flown to Italy for installation near Rome. It is to be carried in a Dakota aircraft which has been used by Ferranti, Ltd., for operational testing of their equipment. When the beacon has been installed by a party of Ferranti engineers, the Dakota will carry out a series of flights which will ensure that the performance of the beacon is satisfactory. A similar beacon is already in operation at London Airport and a third will shortly be fitted at Farouk Airfield, Cairo.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Tube Investments, Ltd., proposes to make an issue of ordinary shares for the purpose of raising £650,000 to be paid to Stewarts & Lloyds as the consideration for cancelling the rights attaching to the company's liaison shares. The company is to issue to Helbert Wagg & Co. or its nominees, for cash at par, 118,182 £1 ordinary shares. These are being placed privately by Helbert Wagg at £6 11s each. This will produce £774,092, and after deducting the subscription price of £118,182 and 1s per share commission the balance will be paid to Stewarts & Lloyds. Against this payment, Stewarts & Lloyds have agreed to deliver written consent to the cancellation of the special rights attached to the liaison ordinary shares which they hold and to the conversion of these shares into ordinary stock.

Electrical Switchgear & Associated Manufacturers, Ltd., report a consolidated profit for the year ended 31st March last, after taxation, of £76,661, as compared with £69,102 for 1949-50, to which is added £47,570 retained by a subsidiary in previous years now to be distributed. The proposed ordinary dividend requires £121,117 (against £65,940), leaving £20,000 (same) to be carried forward.

Christy Bros., Ltd., report a group profit for the year ended 31st March last of £32,176, as compared with £30,472 for 1949-50, after providing £40,339 for taxation. The dividend on the old ordinary shares is maintained at 6 per cent for the year, and a dividend of 1½ per cent is paid on the new ordinary. The balance carried forward is £23,429 (against £18,446 brought in).

The Brush Electrical Engineering Co., Ltd.—The offer of the company of 32s per share for the 226,950 £1 ordinary shares in the National Gas & Oil Engine Co., not already beneficially owned has been accepted by more than 90 per cent of the shareholders concerned.

The Mirrlees Watson Co., Ltd.—The annual meeting was held on 7th August, Mr. D. M. Semple (chairman and managing director) presiding. In his circulated statement the chairman said that the value of orders received by the condensing department had been satisfactory. They were supplying the condensing and feed heating equipment to one of the new power stations of the British Electricity Authority, while included in the orders during the year were special condensing plants for use in the oil, chemical, and milk industries, with auxiliaries of their own design and manufacture. There was an increasing demand for automatic stokers, and their subsidiary company Mirrlees (Engineers), Ltd., had booked repeat orders for lubricating oil pumps in steam, diesel, and hydro-power stations; governor pumps for steam and hydraulic turbines; fuel pumps for gas turbines; and tele-motor pumps for submarines.

New Companies

W. H. Taylor (Derby), Ltd.—Registered 19th July. Capital £6,000. Electrical, radio, lighting, telephone, mechanical, automobile, agricultural, marine and general engineers and engineering contractors, etc. Directors: W. H. Taylor and R. D. Taylor. Secretary: R. D. Taylor. Regd. office: 8, Bold Lane, Derby.

Mannock Rayner, Ltd.—Registered 19th July. Capital £300. Manufacturers, importers, hirers and repairers of and wholesale and retail dealers in and agents for electric motors, pumps, dynamos, magnetos, etc. Directors: J. Hickin, Mrs. G. B. Baker and R. H. Heir. Secretary: Mrs. Elsie W. Heir. Regd. office: 61, Carey Street, W.C.2.

L. W. Smith (Belfast), Ltd.—Registered in Belfast 21st June. Capital £5,000. To acquire the business of an electrical contractor, plumber and general engineer carried on by L. W. Smith at 13, Queen Street, Carrickfergus. Directors: L. W. Smith and T. G. Bunce. Regd. office: 13, Queen Street, Carrickfergus, Co. Antrim.

Rotorcon Switchgear, Ltd.—Registered 24th July. Capital £100. Electrical engineers and contractors, etc. Directors: S. Bowden, E. Bowden and A. G. Crouch. Regd. office: 129a, Courtney Road, Woking.

Empire Electrical Services (Knightsbridge), Ltd.—Registered 26th July. Capital £100. To acquire the business of electrical engineer carried on by L. H. O. Bourne at 224, Brompton Road, S.W.3; and to carry on the business of manufacturers of and dealers in radio sets, valves, gramophones, etc. The

directors are : L. H. O. Bourne and Mrs. P. W. Aldcroft. Secretary : Mrs. P. W. Aldcroft. Regd. office : 224, Brompton Road, S.W.3.

S. & C. Electrical Services, Ltd.—Registered 24th July. Capital £2,000. Directors : W. F. Sansom and F. E. Capps. Regd. office : 120, St. Margaret's Road, Twickenham, Middlesex.

Ship Carbon Co. of Great Britain Ltd.—Increased by £250,000, in £1 ordinary shares, beyond the registered capital of £500,000.

R.T. Electronics (Birmingham), Ltd.—Registered 28th July. Capital £100. Designers and manufacturers of and dealers in electric counting devices, measuring instruments and all types of electrically operated appliances or devices, etc. Directors : P. H. Rock and C. A. Taylor. Regd. office : Station Road, Knowle, Warwicks.

Riverside Accumulator Co., Ltd.—Registered 27th July. Capital £500. To acquire the business of a manufacturer and assembler of batteries now carried on by Arthur M. Webb at 198, Parrock Street, Gravesend as Riverside Accumulator Co. Directors : A. M. Webb, A. Dadson, L. N. Barden, V. M. Todd and Yvonne Pearce. Regd. office : 25/7, Mallinson Road, Clapham Junction, S.W.11.

Rogers & Hall, Ltd.—Registered 28th July. Capital £1,000. Contractors for electrical wiring, maintenance and installation of all kinds, etc. Directors : W. Hall and H. H. Rogers. Regd. office : 79, Marlowes, Hemel Hempstead, Herts.

Studio Plastic & Metal Components, Ltd.—Registered 27th July. Capital £100. Manufacturers of and wholesale and retail dealers in plastics, bakelite, bakelite mouldings, erinoid and vulcanite; sheets, tubes, plates, electrical equipment, etc. Directors : M. Caro and Mrs. Irene M. Caro. Regd. office : 93/5, Newtown Road, Birmingham, 6.

Poole & Morgan, Ltd.—Registered 30th July. Capital £2,000. Mechanical, electrical, consultant, research and general engineers, etc. W. T. Poole signs as director. Regd. office : 15, North Street, Leatherhead, Surrey.

Claydon Engineering, Ltd.—Registered 26th July. Capital £1,000. Manufacturers of and dealers in radio, television, electronic and mechanical devices, etc. The directors are : C. T. Chapman (director, C. T. Chapman (Reproducers), Ltd.) and W. J. Harris (director, Chancery Precision Instruments, Ltd.). Secretary : C. T. Chapman. Regd. office : Vicarage Lane, Steeple Claydon, Bucks.

L.H.S. Advertising Development Co., Ltd.—Registered 30th July. Capital £100. Designers and manufacturers, hirers, repairers, exporters and importers of and dealers in scintillating electric signs, neon, electric, magnetic, revolving, illuminated and other signs, signals and devices for advertising and display purposes, radio and wireless transmitting and receiving sets, etc. Directors : F. D. Lynch, Mrs. Joan M. M. Lynch and F. Spickernell. Regd. office : Dale Cottage, Shellbridge Road, Slindon Common, Sussex.

Esstee Electronics, Ltd.—Registered 1st August. Capital £2,000. V. A. D. Kent is the first director. Regd. office : 9, Cavendish Square, W.1.

Increases of Capital

Coventry Factors, Ltd.—Increased by £25,000, in £1 redeemable preference shares, beyond the registered capital of £25,000.

E. & E. Kaye, Ltd.—Increased by £100,000, in £1 ordinary shares, beyond the registered capital of £200,000.

Sequestration

P. A. Gibson, 73a, Shandwick Place, Edinburgh, electrical engineer, carrying on business as "Gibson & Co." and "Scottish Farm Supplies."—Estates sequestrated 7th August by the Sheriff of the Lothians and Peebles, Edinburgh. Meeting for the election of trustee and commissioners 20th August at Dowell's Rooms, 65, George Street, Edinburgh. Proofs of debt to be submitted by 7th December.

Liquidation

L. Goodman (Radio), Ltd.—Particulars of claims by 3rd September to the liquidator, Mr. M. H. Bradbury, 10, Beauchamp Place, London, S.W.3. This notice is purely formal; all creditors have been or will be paid in full.

Bankruptcies

H. Harris, television dealer, and **H. J. Midwinter,** television engineer, both of 1, Overbury Street, Charlton Kings, Glos., trading as Harris & Midwinter.—Receiving order varied on 26th June by the elimination of H. J. Midwinter from the proceedings, and order of adjudication dated 13th April last varied in like manner, and the petition dated 7th March, 1951, as against Midwinter dismissed.

A. Jacobs, 312, London Road, Westcliff-on-Sea, electrical engineer.—Application for discharge to be heard on 6th September at the Petty Sessions House, Southend-on-Sea.

L. O. Richardson, 205, Railton Road, Herne Hill, London, electrical engineer.—Last day for receiving proofs for dividend 24th August. Trustee, Mr. W. F. Cresswell, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

STOCKS and SHARES

STOCK Exchange markets may now be said to have settled down, after the effects of the Gaitskell bombshell. Part, but not all, of the falls which then occurred has now been recovered. Investment has declined to be panicked out of its shares. In fact, on the falls a good deal of money came into the markets, assisting recovery in a number of the shares which were, at first, particularly affected by the Government proposals. Business has suffered restriction, though possibly not to any greater extent than it would have done in the ordinary way in the holiday month. A good many new issues are said to have been postponed owing to the still prevailing uncertainty with regard to the operation of the Government dividend restriction scheme.

"Rights" Issues

Guidance has been forthcoming from the Treasury on one of the chief uncertainties raised by the White Paper on dividend control; namely, the position of a company which has issued ordinary shares for cash during the period concerned. Broadly speaking, the ruling indicates that such issues will rank for the same percentage dividend as was paid on the old capital. It clears up a point affecting a number of electrical companies, and makes it possible to estimate "standard" dividends in several instances which were omitted from the calculations reproduced in the share lists accompanying these notes last week.

Estimated Yields

The table below estimates (with the usual reservations) the yields at present prices from dividends controlled on the basis now indicated:—

Company	Est. Dividend	Price	Yield per cent
A.E.I.	17½	85/–	£4 2 4
English Electric	12½	63/9	3 18 5
London Elec. Wire ..	10	47/–	4 5 0
Brush 5s	10	6/9	7 8 2
Lancs. Dynamo	22½	103/9	4 6 9
Watford 2s	22½	7/3	6 4 2
Brit. Alum.	10	43/9	4 11 5
Decca 1s	112½	18/9	6 0 0
Falk Stadelmann	15	46/6	6 9 9
Metal Ind.	10	43/–	4 13 0
H. J. Baldwin 2s ..	25	5/9	8 13 9

Tube Investments

The company's £1 shares, 5s up on the week at 6⅜, promptly rallied from the recent market disturbance, during which shares changed hands below £6 for the first time this year. Last year's dividend of 25 per cent was the fourth in succession at that rate, which, consequently, is not threatened now with any reduction. At the same time, the market had begun to entertain definite expectations of the payment, due in November, for the year just ended, and the possibility of hope being deferred in this respect would account for the initial drop in the quotation. Recovery has been helped by news of the arrangements which have been made to finance the cancellation of the special rights attaching to the liaison shares of the company and Stewarts & Lloyds.

A. C. Cossor

Although vague on the point, the latest restrictions might appear temporarily to limit dividends to 5 per cent (or £10,000) in those cases where a company has paid nothing in dividends for the last two years. It is thought, however, that if special cases are to receive consideration, many of them will arise in such circumstances, and that this is one point at least which may be cleared up when the final draft comes to be debated. Meanwhile, A. C. Cossor 5s shares give an example of market reactions to the problem. From 13s 3d three weeks ago, the price dropped incontinently to 9s before a more hopeful view of the position restored it to 12s 6d.

Recovery in Prices

Most of the price changes this week are upwards. Lucas have risen 3s 9d to 38s 9d, Reyrolle ¼ to 82s 6d, Chloride, 63s 3d, are 3s 9d higher. English Electrics improved to 63s 6d, De La Rue to 36s 3d. Johnson & Phillips are 2s 6d better at 63s 3d. Anglo-American Telegraph "A" stock at 106 is four points to the good. Other rises include Crompton 12s, E. K. Cole 20s 6d, Hoover 31s 3d, Henley's 23s 6d, Metal Industries 44s 6d, and East African Power 42s. The falls are few and unimportant.

Thorn Electrical

Thorn Electrical Industries 5s ordinary shares have maintained their price well, at about 9s 6d, on the strength of the progress shown in the annual results declared at the beginning of this month. Trading profit for the year ended last March advanced from £232,000 to as much as £510,000, the net figure being nearly trebled at £170,000 despite much larger tax provisions. This covers more than four times the amount distributed through the 10 per cent dividend, which compares with 20 per cent paid a year ago on the capital as it was before the 100 per cent capital bonus and the cash issue made during the last period. Regarding 10 per cent as the "controlled" dividend rate, the yield on the shares works out at approximately 5¼ per cent.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Flameproof Equipment

AMONG the latest flameproof equipment to be introduced by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, is a flameproof switch-socket and plug complying fully with B.S. 229/46 and C.P. 1003. It has been produced to meet the need of a unit capable of supplying 250 V apparatus by means of trailing cables of the heavy t.r.s. type and is intended for a.c. only. The plug portion has provision for the use of screened cables and there is a clamp to prevent the cable from being pulled out of the plug which is fully interlocked with full flameproof protection of the pins and sockets during withdrawal until the circuit is broken.

Other flameproof equipment includes two types of conduit entry 60/100 W lanterns, pendant and ceiling mounted (side entry) complying fully with B.S. 889/47. Class A glass is fitted.

Interference Suppressors

Radio and television interference suppressors with the trade name "Suratel" are now available for the "Club" electric drills made by WOLF ELECTRIC TOOLS, LTD., Hanger Lane, Ealing, London, W.5. The radio suppressor is priced at 23s 6d and is fitted to the drill lead close up to the machine. The television suppressor, however, is fitted into the machine casing at a standard charge of 8s 6d, including return postage, by any Wolf Service Department.

Welding Generators

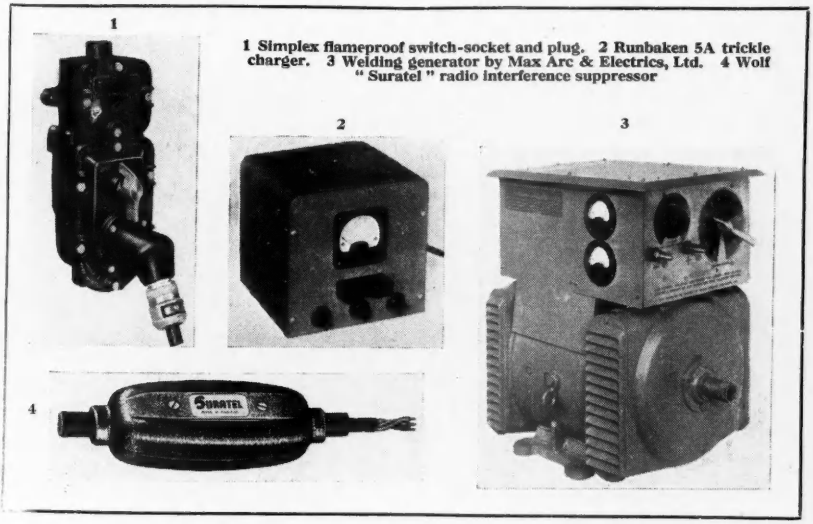
A series of d.c. sets has been added to the range of arc welding equipment made by MAX ARC & ELECTRICS, LTD., 190, Thornton Road, Croydon, Surrey, which includes d.c. generators for belt or engine drive together with a.c./d.c. and d.c./d.c. motor generator sets. The equipment is waterproof and available in a wide range of sizes.

Trickle Charger

In response to the demand for a high capacity trickle charger, RUNBAKEN ELECTRICAL PRODUCTS, 71–73a, Oxford Road, Manchester 1, have produced a 5A model for operation on 200/250 V a.c. mains. It has a retail price of £7 12s 6d.

Rotary Ironer

As a result of an agreement with the Hotpoint Electric Appliance Co., Ltd., H. FISHER (OLDHAM), LTD., Oldham, is, concurrently



1 Simplex flameproof switch-socket and plug. 2 Runbaken 5A trickle charger. 3 Welding generator by Max Arc & Electrics, Ltd. 4 Wolf "Suratel" radio interference suppressor

with the introduction of the new Hotpoint "R.L." rotary ironer (see 6th July issue, page 48), introducing the new Fisher rotary ironer as an optional accessory to its standard and de luxe washers. The ironer is mounted in place of the wringer and operates from the same shaft, being ready for use within five minutes of switching on. Temperatures are automatically controlled for a wide range of fabrics. The loading is 1,200 W and the list price is £21 (plus £10 18s 5d P.T. in this country).

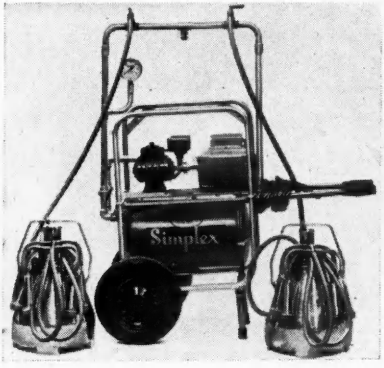
Cleaning Machine for Ships

A new model of the "Dixon" combined scrubbing, polishing and carpet shampooing machine has been introduced by R. G. DIXON & CO., LTD., Empire Way, Wembley, for use on ships. The "Marine Dixon," as it is called, has a special protective finish that resists sea water corrosion and can be used for deck scrubbing; polishing lounges, bars, public rooms, etc.; shampooing carpets in situ; and holystoning wooden decks. The holystoning attachment consists of an aluminium back to which are clamped three segments of holystone. The price varies between £92 17s and £148 17s 6d according to the attachments supplied.

Milking Machines

As a result of requests from dairy farmers, who complained about the rising price of petrol and the cancellation of the subsidy on petrol for farm use, the SIMPLEX DAIRY EQUIPMENT CO., LTD., Cintra House, Cambridge, has brought out an electric model of its "Universal" portable milking machine fitted with a Hoover motor. Light and mobile, it can easily be wheeled from one cowhouse to another and plugged in where required. The standard bucket type milking unit, with its low vacuum and light teatcup assembly, is capable of milking two cows at one time. This electric machine costs £10 less than the petrol driven model, namely £75. New fixed type electric bucket milking plant is also available.

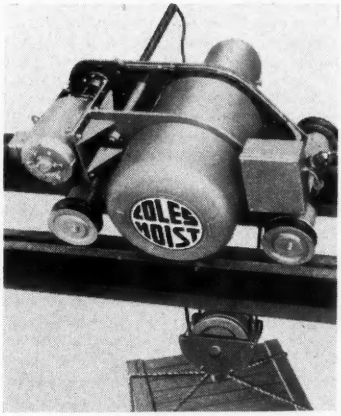
Simplex portable milking machine



Crab for Double Girder Cranes

The compact dimensions of the latest "Coles" electric crab for double girder cranes made by STEELS ENGINEERING PRODUCTS, LTD., Crown Works, Sunderland, have been obtained by extending the hoist sideplates to form a travelling carriage, carrying runner axles mounted in ball bearings. There are 2-, 3- and 6-ton lift capacity models available as one-, two- or three-motor, double girder cranes for a.c. or d.c. operation. They are also readily adaptable for electrifying existing double girder hand cranes with about 26in beam centres.

Travelling crab for double girder cranes



"Marine Dixon" cleaner

NEW BOOKS

Viring Circuits. Edited by E. Molloy. Pp. 216; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 10s 6d.

As the author says in his preface, wiring circuits properly annotated and explained convey far more relevant information to the square inch than any other method of presenting the technical facts which are most in demand by the practical man. This book will undoubtedly be of great value to electrical contractors, installation engineers and maintenance men as it comprises a collection of circuit diagrams which have been proved by experience to offer the busy engineer just the kind of information he needs for instant reference when required.

The opening part deals with industrial and domestic supply systems, the latter including the 13A ring circuit, and earthing and earth leakage trips. Then follow details of lighting controls, sign circuits, time switches, alarm and indicator circuits. There is a wealth of information on motors and control gear, transformers and rotary convertors, voltage regulators, rectifiers and battery chargers, lift and crane control, and thermostatic control of water and space heaters. A further section deals with electronic and other special circuits and the concluding chapter is devoted to electric welding circuits.—R.P.

The Fundamental Principles of Road Passenger Transport Operation. By F. G. Fletcher, A.M.Inst.T. Pp. 287; figs. 100. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 21s.

Lest the title of this book should convey the impression that it is mainly theoretical it should be pointed out that its contents include such practical matters as the recruitment and selection of staff; duties of drivers and conductors; regulations affecting employees; types of ticket issuing and recording machines; planning of routes; road passenger transport law, etc. The purpose of the author, who has had considerable practical experience with London Transport, is to assist young operators to qualify for the R.S.A. certificates and diplomas and for entry into the Institute of Transport.

The first chapter tracing the history of the omnibus is followed by one on the trolley-bus, but trams are not dealt with. On trolley-buses, the author says it has been proved that these " are now more expensive to operate per car mile than the motor-bus," but it is of course necessary to allow for the difference in capacity of the two types of vehicle. Later it is acknowledged that " as a vehicle for the rapid movement of road passenger traffic the trolley-bus has no equal, its only drawbacks being its immobility through being track-tied and the possibility of a complete stoppage in the event of a power failure." A comment on the position where the municipal authority produces its own electric power seems to refer to conditions before nationalization of the electricity supply industry in 1948 and this should be made clear.

Useful information and advice on educational opportunities are provided in an appendix.—H.W.

Mind, Life and Body. By Reginald O. Kapp, B.Sc. (Eng.)., M.I.E.E. Pp. 196; index. Constable & Co., Ltd., 10–12, Orange Street, London, W.C.2. Price 12s 6d.

As may be expected from an author of Professor Kapp's originality of outlook here is an unusual book. From Aristotle onwards many philosophers have discussed the question of control of our material bodies by our non-material minds but few, if any, can have approached the problem with a stronger determination to avoid prejudice and loose thinking. An outstanding feature of anything written by Professor Kapp is that he does not force opinions; he explores the field dispassionately and invites us to examine the results with him.

There may be two alternative paths; he shows us both with all the pitfalls. The simplest as well as the most complicated act of the human body can be traced back through muscle, nerve and synapse to the brain. Relay operates relay in conventional manner but how does the primary relay work? Can we extrapolate into this region our conceptions of causality based on physical forces?

No attempt is made in this book to do

much more than formulate the problem, but the reader will be surprised to find how large a field is opened up by these questions. Moreover he will reap some satisfaction in appreciating what even Goethe missed, that all truth does not need to be psychologically comprehensible. As a scientist Professor Kapp feels it high time that the investigation of the mind-body relationship should be subjected to scientific method and through easy chapters he leads us gently along, ultimately contributing a modicum of peace to inquiring minds in some tentative conclusions, the greatest of which is that mind and life are after all active realities, and there is much more in the universe than physics.—P.D.

Capacitors for Industry. By C. W. Bloomquist, R. M. Partington, C. R. Craig and R. C. Wilson. Pp. 246; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 36s in U.K.

This book is by members of the staff of the General Electric Company of America as part of a series of books on electrical subjects as related to General Electric products. It is written " down " to the industrial plant engineer who, it is assumed, will be unable to grasp the intricacies of the phase relationship of voltage and current in a sine wave. Instead, all lagging currents are described as magnetizing currents demanded from the supply and capacitors are " kilovar generators " supplying current to the supply. As a result of this many of the formulæ will be mysterious and without physical significance to the uninitiated. The formulæ are also in some cases " rule of thumb " approximations. For example, the kVA demand of an induction motor is quoted as $0{\cdot}75 \times$ h.p.

Using this simple treatment, chapters are given on measurements, release of power system capacity, voltage improvement, loss reduction, use of series capacitors, use of capacitors with induction motors, and economic studies. Figures are quoted of costs and tables of useful data such as resistance and reactance factors for cables in ducts are provided in terms of American specifications. A chapter is devoted to automatic control and the construction of load diagrams. The book ends with a brief description of the construction of G.E. power capacitors, a résumé of N.E.M.A. standards and a set of specifications for power factor correction installations. A general chapter describes G.E. capacitors outside the range of industrial types.

The greatest value of this book is to indicate the need for a serious treatment of the subject based on British practice which would bring home to the industrial user in this country the value of power factor correction and other applications of capacitors, and to the electricity authorities the possibility of using to the greatest advantage our limited power generating resources. —D.S.G.

An Advanced Treatise on Physical Chemistry. Volume II. The Properties of Liquids. By J. R. Partington, D.Sc. Pp. 448; figs. and index. Longmans, Green & Co., Ltd., 6–7, Clifford Street, London, W.1. Price 50s.

This volume is the second in a comprehensive series on physical chemistry, the first of which was dealt with in the *Electrical Review*, 28th April, 1950 (page 808). Following the same plan as its predecessor, it gives special emphasis to experimental works and the theoretical principles connected with this. It is concerned with the general physical chemistry of the liquid state and deals with the theory of liquids, density, thermal expansion, compressibility, viscosity, thermal conductivity, surface tension, specific heat, vapour pressure, boiling point, latent heat of evaporation, and the critical state. Apart from a few highly specialized topics, each division has an adequate theoretical treatment and like the first volume the book contains an almost overwhelmingly comprehensive collection of references to other literature. This makes it all the more valuable, particularly as much of the information it contains has never been collected in such a readily accessible manner.—R.P.

Books Received

Electric Lifts. By R. S. Phillips. Third edition. Pp. 377; figs. 211; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 50s.

Elementary Electrical Engineering. By A. E. Clayton and H. J. Shelley. Third edition. Pp. 490; figs. 340; index. Longmans, Green & Co., Ltd., 6 and 7, Clifford Street, London, W.1. Price 14s.

Report Writing. By Carl G. Gaum, Harold F. Graves and Lyne S. S. Hoffman. Third edition. Pp. 384; figs. 18; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 35s in U.K.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) will be obtainable after 26th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

16213. Compagnie Générale d'Entreprises Electriques.—System of control and signalling from a distance. 28th May, 1946. (657673.)

1947

821. Feketey, A. F.—Electric heating. 28th April, 1950. (657745.)

6298. Decca Record Co., Ltd., and O'Brien, W. J.—Valve amplifiers. 11th February, 1948. (657747.)

19342. British Thomson-Houston Co., Ltd.—Radio locating equipment. 18th July, 1947. (657675.)

23609. Bolelli, A.—Electromagnetic brake device for yarn winding bobbins of flyer-spinning machines. 8th September, 1948. (657702.)

24412. Metropolitan-Vickers Electrical Co., Ltd., and Belsey, F. H.—Magnetic amplifiers. 24th September, 1948. (657677.)

29100. Standard Telephones & Cables, Ltd.—Selective calling systems. 31st October. 1947. (657894.)

33118. Elin Akt.-Ges. für Elektrische Industrie, and Senft, W.—Arc welding with coated electrodes. 16th December, 1947. (657619.)

1948

2301. General Electric Co., Ltd.—Pulse code modulation systems. 20th January, 1950. (657681.)

4030. Standard Telephones & Cables, Ltd.—Apparatus for welding longitudinal wires to parallel conductors. 11th February, 1948. (657622.)

5089. Western Electric Co., Inc.—Telegraph exchange systems. 20th February, 1948. (657684.)

5714. Standard Telephones & Cables, Ltd.—Moulding-machine for bank strips suitable for telephone switch banks. 26th February, 1948. (657623.)

6705. Brush Development Co.—Electro-mechanical transducers. 3rd March, 1948. (657624.)

9186. White, E. L. C.—Controlling the phase of electrical oscillation generators. 11th March, 1949. (657625.)

9187. White, E. L. C.—Frequency discriminator circuits. 22nd March, 1949. (657626.)

9737. Standard Telephones & Cables, Ltd., Ridler, D. S., and Brown, L. R.—Electric signalling systems. 1st April, 1949. (657760.)

10660. Elliston, E. R.—Electrically operated hydraulic power units. 19th April, 1949. (657761.)

11123. Sunvic Controls, Ltd., and Blackman, P. F.—Electric amplifiers. 19th May, 1949. (657690.)

12393. Brecomin (England), Ltd., and Godeck, J. E.—Electric dictation installations. 3rd June, 1949. (657627.)

15185. British Thomson-Houston Co., Ltd., Edmundson, D., and Atkins, B.—Low-frequency meters. 4th June, 1948. (657767.)

15457. Radio Corporation of America.—Amplitude modulator. 8th June, 1948. (657768.)

17145. Brush Development Co.—Mountings for electro-mechanical transducer elements. 25th June, 1948. (657632.)

18847. Automatic Telephone & Electric Co., Ltd., Davison, A., and Robinson, N. H.—Electrical signalling systems. 29th June, 1949. (Cognate application 23615, 8th September, 1948.) (657776.)

19219. Lubszynski, H. G.—Circuit arrangements comprising a television transmission tube. 12th July, 1949. (657633.)

19858. Cassman, H.—Television transmission tubes. 14th September, 1947. (Divided out of 657613.) (657634.)

22107. Sperry Corporation.—Directional couplings for ultra-high-frequency electro-magnetic wave transmission lines. 21st August, 1948. (657826.)

22715. Sneath, O. B., and Knight, E. A.—Methods of gain control in audio-frequency amplifiers. 23rd September, 1949. (657701.)

23228. Harding, G. N., and Thal, O. F. W.—Movements of electrical measuring instruments and like assemblies. 1st September, 1949. (657636.)

23525. Holophane, Ltd., and English, S.—Bowl-type refractors. 29th August, 1949. (657779.)

23641. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electric discharge tubes with liquid electrodes. 8th September, 1948. (657829.)

28142. British Thomson-Houston Co., Ltd.—Refrigerator latches. 29th October, 1948. (657707.)

28604. Indestructible Paint Co., Ltd., Pye, C. R., and Bremer, H. F.—Electrically insulating coating compositions. 17th October, 1949. (657782.)

29453. British Thomson-Houston Co., Ltd.—Circular electric discharge lamps. 12th November, 1948. (657709.)

30573. Pye, Ltd., and Hutton, J. A.—Method of and apparatus for producing amplitude modulated signals from a velocity-modulation electron-discharge tube of the reflex type. 21st November, 1949. (657785.)

30716. Sperry Gyroscope Co., Ltd., and Luttrelle, W. F.—Electrically operated relays. 25th November, 1949. (657914.)

32630. Schrack Elektrizitäts Akt.-Ges., E.—Electromagnetically tripped overload cut-outs. 16th December, 1948. (Cognate application 32631, 7th April, 1948.) (657787.)

33506. Elin Akt.-Ges. für Elektrische Industrie, and Senft, W.—Electrode-coating pieces for automatic arc welding and process and device for their production. 30th December, 1948. (Addition to 657662.) (657643.)

1949

2343. General Electric Co., Ltd., James, E. G., and Lindell, A. O. E.—Crystal contact devices. 24th January, 1950. (657793.)

4052. Moss, E. W. (Rescalvo, J. J. J. R.).—Supports for electric light fittings. (657720.)

5213. Pearce, A. P.—Steam boilers of the water tube type. 25th February, 1949. (657799.)

5297. Plessey Co., Ltd., and Webb, C. D. H.—Terminal connections for electrical wiring systems. 28th July, 1949. (657722.)

5716. Philips Electrical, Ltd.—Flashlamps. 2nd March, 1949. (657802.)

5723. British Thomson-Houston Co., Ltd.—Linear sweep wave generators. 2nd March, 1949. (657837.)

5727. Cinch Manufacturing Corporation.—Electrical contacts for holders for thermionic valves, plugs or other electrical devices having projecting prongs. 2nd March, 1949. (657838.)

5843. Babcock & Wilcox, Ltd.—Furnaces. 3rd March, 1949. (657916.)

5847. British Thomson-Houston Co., Ltd.—Circuit arrangements for pulse rate measurement. 3rd March, 1949. (657840.)

5996. Akt.-Ges. Brown, Boveri, & Cie.—Annular iron core choking coils for heavy current moving contact current convertors. 4th March, 1949. (657842.)

6413. Allmanna Svenska Elektriska Aktiebolaget.—Means for regulating stage lighting systems and the like. 9th March, 1949. (657847.)

6414. Allmanna Svenska Elektriska Aktiebolaget.—Supporting means for lighting control units employing transductors. 9th March, 1949. (657848.)

6587. British Thomson-Houston Co., Ltd.—Clamping means for laminated cores of electric induction apparatus. 10th March, 1949. (657851.)

6736. Westinghouse Electric International Co.—Electric circuit interrupting devices. 11th March, 1949. (657807.)

6888. Bylock Electric, Ltd., and Mathes, C. J.—Spray guns. 5th December, 1949. (Cognate application 20981, 12th August, 1949.) (657854.)

6897. Lonnqvist, K. E., and Kjell-Berger, B. G. K.—Electric connecting plugs. 14th March, 1949. (657855.)

6922. Lawson, C. S.—Electric cartridge fuse links. 14th March, 1949. (657728.)

6930. British Thomson-Houston Co., Ltd.—Magnetic cores. 14th March, 1949. (657856.)

6932. Squire, F. E. (Daly, J.).—Electrically heated fabric. 14th March, 1949. (657729.)

7085. Fairweather, H. G. C. (Svenska Turbinfabriks Aktiebolaget Ljungstrom).—Device with radial-flow turbines for elastic-fluid or radial-flow compressors with outer and inner casings exposed to different temperatures. 15th March, 1949. (657860.)

7332. Westinghouse Electric International Co.—Electrical induction apparatus. 17th March, 1949. (657866.)

7338. British Thomson-Houston Co., Ltd.—Clothes washing and drying machines. 17th March, 1949. (657731.)

7636. British Thomson-Houston Co., Ltd.—Apparatus for coating hollow glassware. 21st March, 1949. (657871.)

7659. Alkan, M. L.—Electrodes for electrolytic processes. 21st March, 1949. (657872.)

7719/20. Sulzer Frères Soc. Anon.—Rotors and the like formed from sections united by annular welds. 22nd March, 1949. (657874/5.)

7926. British Thomson-Houston Co., Ltd.—Temperature control systems. 23rd March, 1949. (657878.)

8237. Metropolitan-Vickers Electrical Co., Ltd.—Variometers. 25th March, 1949. (657879.)

8451. Omnium Lyonnais.—Elastic hanger for tramcar current-supply overhead lines. 29th March, 1949. (657735.)

8497. Hall Telephone Accessories, Ltd., and Harrington, P. T. R.—Envelope opening and like sheet or package handling machine. 24th June, 1949. (657884.)

8632. Westinghouse Electric International Co.—Electrical induction apparatus. 30th March, 1949. (657888.)

9232. Weibull, N. R. M.—Electric timing relay. 5th April, 1949. (657919.)

9665. Modee, G. V. G., Strandlund, J. H., and Ek, F.—Telecommunication systems. 28th November, 1945. (Divided out of 657612.) (657657.)

9666. Modee, G. V. G., Strandlund, J. H., and Ek, F.—Switching arrangement comprising crossbar switches. 28th November, 1945. (Divided out of 657612.) (657658.)

9881. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 12th April, 1949. (657924.)

13118. Westinghouse Electric International Co.—Elastic-fluid turbine apparatus. 17th May, 1949. (657926.)

13405. Steen, C. A.—Electric steam boilers. 19th May, 1949. (657928.)

13865. Metropolitan-Vickers Electrical Co., Ltd.—Fluid control valves. 24th May, 1949. (657934.)

14395. Sala, P.—Electromagnetic switches with double break. 30th May, 1949. (657939.)

14597. British Thomson-Houston Co., Ltd.—Impellers for dishwashing apparatus. 31st May, 1949. (657940.)

15541. Metropolitan-Vickers Electrical Co., Ltd.—Transmission of electric pulses. 10th June, 1949. (657947.)

18496. Westinghouse Electric International Co.—Control systems for supplying current from a three-phase source to a single-phase load. 13th July, 1949. (657810.)

22713. Harding, G. N., and Thal, O. F. W.—Movements of electrical measuring instruments and the like. 1st September, 1949. (Divided out of 657636.) (657661.)

29213. Elin Akt.-Ges. für Elektrische Industrie, and Senft, W.—Manufacturing of ready shaped rigid pieces of flux material for electric arc welding. 16th December, 1947. (Divided out of 657619.) (657662.)

1950

21812. Cassman, H.—Television transmission tubes. 2nd February, 1947. (Divided out of 657613.) (657666.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

1st September

TENDEX.—No. 698,235. Class 7. Machines for the processing of meat.—Lan-Elec, Ltd., 220–221, Bedford Avenue, Slough, Bucks.

PHILIPS.—No. 669,330. Class 9. Electric capacitors; electric ballasts and electric starting apparatus all for use with electric discharge lamps; photographic flash bulbs; infra-red and ultra-violet apparatus and lamps, none being for medical or surgical purposes; radio transmitting and receiving apparatus; television receiving apparatus; electronic discharge tubes; radio gramophones and parts thereof, etc., electric battery chargers, condensers, welding apparatus, electrodes, electrode holders; electric apparatus for use as timing devices in welding apparatus; electric high frequency apparatus, current and voltage indicators, current rectifiers, transformers, photo-electric cells; sound reproducing and amplifying apparatus and parts and fittings, all included in Class 9; cinematograph apparatus and parts and fittings, all included in Class 9; electric resistance wire made of tungsten or of molybdenum for use in the construction of electric lamps and radio valves; etc.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

IGNISCOPE.—No. 696,662. Class 9. Apparatus included in Class 9 for testing internal combustion engines and for testing equipment associated with internal combustion engines.—English Electric Co., Ltd., Queen's House, 28, Kingsway, London, W.C.2.

IONOMATIC.—No. 698,171. Class 11. Apparatus and installations for the treatment of water and parts included in Class 11 of such apparatus and installations.—Pulsometer Engineering Co., Ltd., Nine Elms Iron Works, Oxford Road, Reading, Berks.

PEROMEX.—No. 698,072. Class 17. All goods included in Class 17, but not including rubber separators for electric storage batteries or any goods of the same description as these excluded goods.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1–3, St. Paul's Churchyard, London, E.C.4.

8th September

ABRADOR (design).—No. 688,356. Class 8. Electrical dry shaving apparatus and parts included in Class 8.—Société Industrielle Allegro S.A., Emmenbrucke, Switzerland. Address for service c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

SOBELL (design).—No. 667, 125. Class 9. Radio receiving sets, television receiving sets and radio gramophones.—Sobell Industries, Ltd., Langley Park, near Slough, Bucks.

SERVO-CONTACT (design).—No. B696,517. Class 9. Electromagnetic relays.—Servo-Contact, Paris, France. Address for service, c/o F. J. Cleveland & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

PARLEVOX.—No. 699,106. PARLAVOX.—No. 699,226. Class 9. Telephonic apparatus and sound amplifiers.—Sir John Craven Cardew, 3, Mount Street, London, W.1.

ROSAMON.—No. 699,192. Class 9. Electric switches.—Heating Equipment., Ltd, Hughenden Manor, Petersfinger, Alderbury, Salisbury.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia. — BRISBANE. — 12th September. Queensland State Electricity Commission. Distribution materials for the Capricorna Regional Electricity Board. (C.R.E. (I.B.) 66862/51. Ten/2795.)*

19th October. City Council. Supply of 1,450 street lighting lanterns. (C.R.E. (I.B.) 67312/51. Ten/2785.)*

MELBOURNE.—12th September. State Electricity Commission of Victoria. Transformers, ranging from 10 kVA to 2,000 kVA. (C.R.E. (I.B.) 67407/51. Ten/2773.)* Lightning arrestors. (C.R.E. (I.B.) 67408/51. Ten/2779.)*

NEW SOUTH WALES.—19th December. Agent-General for New South Wales. Alternative tenders for 300 or 500 suburban electric motor and trailer cars. (C.R.E. (I.B.) 67524/51. Ten/2787.)*

Bacup.—3rd September. Corporation. Street lighting equipment. (See this issue.)

Basingstoke.—28th August. Park Prewett Group Hospital Management Committee, No. 47. Electric lamps for six months from 1st October, 1951. F. Hales, secretary, Group Hospital Management Committee, Basingstoke, Hants.

3rd September. Corporation. Fluorescent street lighting. (See this issue.)

Bingley.—5th September. U.D.C. Street lighting installation. (See this issue.)

Chichester.—31st August. City Council. Five automatically controlled, electrically driven, pumping units and auxiliaries for water supply to West Dean, East Dean and Singleton. Water Engineer's Office, Greyfriars, North Street.

Gillingham (Kent).—27th August. Corporation. Electrical installation in 250 houses. (See this issue.)

10th September. Electrical installations in 33 flats. (See this issue.)

India.—MADRAS.—15th September. Government Stores Purchase Committee. Switchgear equipment. (C.R.E. (I.B.) 67620/51. Ten/2790.)*

14th November. Department of Electricity, Government of Madras. Power transformers and outdoor switchgear for Tungbhadra hydro-electric scheme. (C.R.E. (I.B.) 67583/51. Ten/2784.)*

Keynsham.—22nd August. U.D.C. Electrical installation work in 37 houses being erected on Norman Road Estate, Saltford. Deposit £2 2s. Tender forms from the surveyor, Council Offices.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Kidwelly.—29th August. Town Council. Seven centrifugal pumping units, all electrically operated and automatically controlled. A. P. I. Cotterell and Son, engineers, 54, Victoria Street, Westminster, S.W.1.

Manchester.—3rd September. Waterworks Committee. Electric control and supply cables. (See this issue.)

New Zealand.—WELLINGTON.—13th November. State Hydro-Electric Department. Four 6,667 kVA, 66/6.35 kV transformers. (C.R.E. (I.B.) 67457/51. Ten/2783.)*

Peterborough.—City Council. Electrical installations in 188 houses. (See this issue.)

Romford.—10th September. Corporation. Street lighting equipment. (See this issue.)

Uruguay.—MONTEVIDEO.—18th September. Usinas Electricas y Telefonos del Estado. Six 1,500 kW diesel generating sets. (C.R.E. (I.B.) 67188/51. Ten/2778.)* 19th September. Two 600 kW diesel generating sets. (C.R.E. (I.B.) 67187/51. Ten/2772.)*

Warwickshire. — County Council. Firms wishing to have their names placed upon a list of approved contractors for heating, hot and cold water supplies, kitchen equipment, etc., and electric light and power installations, should apply by 27th August. (See this issue.)

ORDERS PLACED

March.—U.D.C. Electrical installations in 42 houses (£1,125).—Eastern Electricity Board.

Newcastle-on-Tyne. — Regional Hospital Board. Switchboard at Newcastle General Hospital (£1,277).—Brush Electrical Engineering Co., Ltd.

City Council. Supply of 209 electric lamp columns for the various housing estates (£2,034). —Revo Electric Co., Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bolton.—Houses (52), Johnson Fold estate extension; Roy & Partners, Ltd., 25, Cross Street, Manchester.

Bromsgrove. — Development of site for houses, Nuthurst Road, Cofton Hackett, for R.D.C.; H. T. W. Gough, architect, 45, Newhall Street, Birmingham, 3.

Cardiff.—Factory, Newport Road industrial estate; H. H. & S. Budgett & Co., Ltd., New Street.

Castle Ward.—Houses (92), Ponteland, for R.D.C.; H. R. Atkinson & Co., builders, Riding Mill, Northumberland.

Coventry.—Factory premises, King Street and St. Nicholas Street junction; Coventry Cees, Ltd., cycle manufacturers.

Comprehensive high school, Broad Lane; city architect.

Dagenham.—Flats (42) and six shops with 12 flats above, Dagenham Road; borough engineer.

Derby.—Houses (20) and 40 flats, Louvain Road; H. J. Warner, Ltd., Mickleover.

Dudley.—Erection of Buffery Road School; Webb & Gray, architects, High Street.

Eton.—Dwellings (36), Stoke Poges, for R.D.C.; Rix & Rix, architects, High Street, Burnham.

Flints.—Modern secondary school, Trelogan area; county architect, County Buildings, Mold.

Gravesend. — Flats (53), Parrock Farm estate; North Kent Construction Co., Ltd., builders.

Great Yarmouth.—Fish factory, South Denes; H. A. Holmes & Sons, Ltd., South Ice Hill House, Gorleston.

Hemel Hempstead.—Dwellings (107), for Development Corporation; Leslie & Co., Ltd., builders, Kensington Square, London, W.8.

Ilford.—Houses (30), Roding Lane South; John Holland, Ltd.. Seven Kings.

Ince - in - Makerfield. — Dwellings (40), Battersby Street site, for U.D.C.; R. Lewis, surveyor, Town Hall.

Leicester.—Houses (38), New Parks estate; W. Deane (Leicester), Ltd., 103, Kirby Road.

Lincoln.—Dairy block and agricultural cottages (£21,343), Riseholme Farm Institute; Lindsey county architect, Lincoln.

Liverpool.—Large factory on site at junction of Birchill Road and Kirkby Bank Road; Coates Bros. & Co., Ltd., printing ink manufacturers, Easton Street, London, W.C.1.

London. — Paddington. — Primary school, Bishop's Bridge Road; Drake & Lasdun, architects, 29, Sackville Street, W.1.

St Pancras.—Flats (195), Cumberland Market; Hugh Roberts & Davies, architects, 27, Grosvenor Place, S.W.1.

Southfields.—Flats (48), West Hill Road; Hamilton, Wakeford & Partners, architects, 7, Connaught Place, W.2.

March.—Infants' school (£36,960) and junior school (£49,280) in Maple Grove; Isle of Ely county architect, March, Cambs.

Mitcham (Surrey). — Additional factory premises; G. A. Cramp & Sons, Ltd., Eveline Road.

Montgomeryshire.—Works of adaptation, etc., at Llangoed estate, for farm institute (£44,750); county architect, County Offices, Welshpool.

Newport (Salop). — Child welfare clinic (£10,750); G. A. Poole, 37, Liverpool Road, Newcastle, Staffs.

Northampton. — Flats and bungalows, Spencer estate and dwellings at Abington estate; W. J. Richardson & Son, 30, Wycliffe Road.

Nuneaton.—Research laboratories for Motor Industry Research Association; W. J. Whittall & Son, Ltd., Birmingham.

Oldham.—Stage 1 of secondary school at Hathershaw; Moston Brick & Building Co., Ltd., Collyhurst, Manchester.

Rotherham.—Additional accommodation at Spurley Hey Secondary School (£13,952); Parkin (Rotherham), Ltd., Bawtry Road.

Rugby.—Houses (16), Wolvey; R.D.C. architect.

Shardlow.—Flats (28), Spondon site, for R.D.C.; Pearman & Wade, Chaddesden, nr. Derby.

Sheffield.—Factory, Forncett Street; Firth Brown Tools, Ltd., Carlisle Street East.

Smethwick.—Houses (178), Brandhall Road; borough engineer.

South Westmorland. — Houses (34). Bowston, Witherslack, Milnthorpe, Levens and Burneside; Middleton & Jones, architects to R.D.C., 1, Queen Street, Lancaster.

Sutton Coldfield.—Bungalows (24), Cat Hill; Wolesey Housing Association, 1, Belvedere Road, Birmingham.

Houses (16), Falcon Lodge estate; W. H. James & Son, Whitehouse Common Road.

Wallasey.—Secondary modern school, Leasowe; Ernest Griffiths & Son, electrical consultants, Kinders, Allport Road, Bromborough.

Walsall.—Garage (£29,500), northern public works depot; borough surveyor.

Extensions to Council House, Tower Street; H. W. Shipley & Partners, architects, Kingscourt, Bridge Street, Walsall.

Watford.—Extensions to Clarendon Road police station (£11,052); F. W. Padwick, builder, 141, Ballards Lane, London, N.3.

Wellingborough.—Large bakery for C.W.S., Ltd.; W. J. Reed, architect to C.W.S., 99, Leman Street, London, E.1.

West Bromwich.—Conversion of Lyndon House into home for elderly persons; V. M. Steed, chairman of Welfare Services Committee.

Factories, Bromford Lane: Victoria Spring Co., 158, Walsall Street, and Hargate Tool & Engineering Co., Ltd., 94, Hargate Lane.

Whickham (Co. Durham).—Houses (54) for U.D.C.; Fennel & Co., architects, Bridge End Chambers, Chester-le-Street.

Windsor.—Rebuilding business stores, High Street; Caleys, Ltd. (John Lewis & Co., Ltd.).

Worcestershire.—Police houses (16), Brandhall Lane, Warley; Batham & Bedall, Ltd., Moor Street, Brierley Hill.

Worthing. — Flats (24), Pavilion Road; Worthing Estates Building Co., Ltd., 72, Broadwater Road.

Factory extensions; Herbert Williamson & Co., Ltd., Dominion Road.